

# COAL AGE

Vol. 1

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No. 8

EVERY man in charge of mines believes he is traveling the road that leads to safety and economy in operation. None will claim to have reached the goal, and all will admit there are numerous routes to follow, but each aspirant is convinced that his course is the best to pursue.

Did you ever stop from your own labors, and in a moment of relaxation watch the other fellows struggling along? And did you notice as you stood there, that one well-beaten thoroughfare was crowded with men of hardened visage, scowling, cursing, jostling by?

Well, the men you saw were all struggling for safety and economy (mostly economy) in coal mining, and they were the ones who travel the road of the Bully. To their way of thinking, results can only be obtained by intimidation, and they attempt to drive, coerce and browbeat everyone with whom they come in contact.

If you were to call one of these fellows aside, he would say kindness is a mistaken virtue, tell you the men under him are an ignorant lot, and suggest that you will fail if you distinguish between the machine at the face and the man who runs it.

Such men in one way remind me of the squatters who lived in the mountains of West Virginia and Kentucky a few years ago. Many of them are still voting for Jeff Davis, and had never seen a steam locomotive until railroads were built in to develop the coal. Few of them could see through a pane of glass, or, at least, so I gathered from the fact that they always threw the window in the railway coach wide open even when it was zero weather outside. These mountaineers followed one invariable rule, "Never let the other fellow think you are afraid." They might knock your hat off, tramp on your foot, or accidentally poke their rifles in your eye, but never an apology would you hear. They were sorry in their hearts for causing you distress, but for outward expression of such feeling, you might look in vain. An apology, so they thought, would be sure indication of physical cowardice.

So it is with some mine officials; they believe that an exercise of reason, or application of "The Golden Rule" in dealing with their men, is an acknowledgment of incompetency, or inability to fill the bill as boss of the mine.

You can force up tonnage and drive down costs for a day, but such a record cannot be continually used as a pry for a better average on the day that follows. Mule-nature, human-nature, even the rope, will not stand such treatment. Moreover, when the man higher up discovers you are a whipper-in, and depend on physical force instead of mental caliber, the end will be near.

Just as the provision of good houses and pleasant surroundings will attract superior men, so will a capable humane management secure the most intelligent class of labor. It requires in the neighborhood of 700,000 miners to produce the coal needed in America each year, and it is reasonable to conclude that the man who has the most ignorant and vicious of this great army of men, will have difficulty in meeting the competition of the fellow who has secured the best of the lot.

If you honestly believe that the men under you will only respond to coercion, consider a minute whether or not the fault is your own. What reputation do you bear among your miners? Are you unreasonable, dictatorial and difficult of approach? If so, what kind of men do you expect to get in an industry that has no waiting list, and where jobs can be had for the asking?

In conclusion—safety and economy are not to be attained through the sole exercise of physical force, and mine officials who travel that road are going to find it hard sledding. Most unfortunate of all, it is difficult to convert such men—in fact, I never knew but one who did change, and that was brought about by a young mule with a five-foot reach and a two-year memory. In some ways it is a shame the mule is being replaced by the gathering motor.

# A Modern Twin Coal Mining Plant

The Bunsen Coal Company, the western fuel-producing subsidiary of the United States Steel Corporation, has several operating mines in the Danville, Ill., district. It has recently purchased, and is now developing through the plant described below, a large tract of coal land, located on a branch of the Chicago & Eastern Illinois Railroad, five miles southwest of Clinton, Indiana.

It was decided to develop two seams of coal on this property, the No. 4 and No. 5, and as a matter of economy, both in regard to first cost and the cost of operation, it was decided to build a combined plant to serve the two mines and thus avoid a duplication of machinery, buildings and railroad tracks. It was not

By Warren R. Roberts\*

*Two mines are developed through twin shafts and twin tipples. The boiler house, power plant and remainder of the equipment are shared in common. The construction of the entire plant is typical of the best modern practice and is described in detail.*

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of the complete plant above ground, adopted the following general forms of construction to meet these requirements.

The foundations for the buildings and for all machinery are of concrete. The walls of all buildings are of reinforced concrete, excepting those of the office building, which are of concrete blocks. The roofs, excepting that of the office building, which is slate, are of cement tiles laid directly on steel purlins. The roof frames are entirely of structural steel. The floors, excepting that of the blacksmith shop, are of concrete, and the window frames and sashes are of steel.

The tipples are built entirely of structural steel and have their roofs and sides covered with corrugated steel. It will



FIG. 1. GENERAL VIEW OF TIPPLES, HOISTING PLANTS AND BOILER PLANT

found advisable, however, to combine the tipples, as at first contemplated, and therefore two main hoisting shafts were sunk at points about 200 ft. apart, one shaft going down only to the No. 5 seam and the other passing on down through the No. 5 to the No. 4 seam. As a further economy it was decided to sink a combined air and escapement shaft for the two mines. This shaft has two air compartments and two manways, one of each running to the No. 5 level only and the others passing on down to the No. 4 seam.

As a precaution against mine accidents, a large pillar of coal was left surrounding the No. 4 shafts where they pass through the No. 5 seam. The underground development will not be discussed in this article, but it may be re-

marked in passing that all arrangements for both mines are most excellent, and in keeping with the character of the surface plant.

## GENERAL CONSTRUCTION

It was the desire of the management of the Bunsen Coal Company, as expressed through their general superintendent, Clay F. Lynch, to have these mines developed along lines which would typify the best modern practice. It was also desired that, in so far as possible, and consistent with such practice, all materials used in the construction of the entire plant should be those manufactured by the subsidiary companies of the United States Steel Corporation. The Roberts & Schaefer Company, to whom were intrusted the designing and building

be seen therefore that this plant is as nearly fireproof and permanent as the present status of the building art permits.

The combined plant for serving the two mines consists of two steel tipples and two reinforced-concrete hoisting plants, one for each main shaft. These are the only units composing the plant which it was found advisable to duplicate. The boiler plant, generator plant, shops, storehouse, miners' bath house, ventilating plant, granary, stable and office were so designed and located as to serve both mines equally well.

A general view of the tipples, hoisting plants and boiler plant, looking down the railroad tracks from the "empty yard," is shown in Fig. 1. This view was taken before the sheet-metal roofing and siding had been put on the tipples and when



some other parts of the plant were not quite complete. It illustrates fairly well, however, the arrangement of the two hoisting plants with the tipples facing each other and seven railroad tracks passing between, three under each tipple and one "passing track." The tipples are of the style termed "end pull," that is, having the engine brace running

specially invited, however, to the large windows with steel frames and sash.

The smokestack seen in this view is built entirely of reinforced concrete and is 10 ft. in diameter on the inside and 175 ft. high. It is connected with the boilers by a steel smoke flue and is lined for 50 ft. above the top of the flue with firebrick.

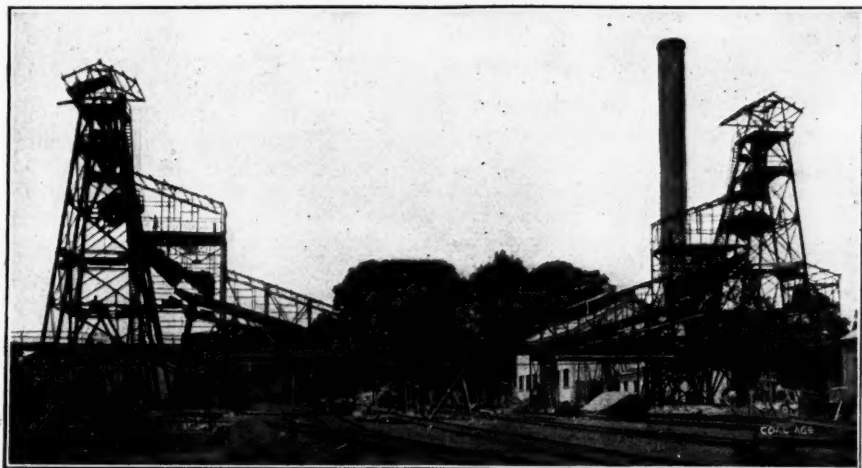


FIG. 2. VIEW OF TWIN TIPPLES UNDER CONSTRUCTION

parallel with the railroad tracks. This design locates the two hoisting plants alongside of the tracks as shown. The boiler plant is placed adjacent to the No. 5 hoisting plant, and the balance of the plant, with the exception of the stable and granary, is on the hillside in the rear of the boiler house.

#### THE STEEL TIPPLES AND BOILER PLANT

A view of the twin tipples, looking up the railroad tracks, is shown in Fig. 2. This photograph also was taken before the sheet-metal roofing and siding were in place, in order to illustrate the equipment.

The tipples are substantial steel structures and contain the usual Indiana equipment, consisting of self-dumping cages, standard Akron bar screens above the weigh hoppers; weigh-hoppers for weighing screened lump and a pair of the Roberts & Schaefer Company's standard roller shaker screens for making screened coal and loading on three railroad tracks. All this equipment is of the best construction and has every convenience for changing the grades of coal.

The steel trestle connecting the two tipples, shown in this view, is for handling mine cars and all necessary supplies to and from the No. 4 shaft across the railroad tracks to the shops and storehouse, which are located on the same side of the tracks as the No. 5 shaft.

An end elevation of the boiler plant and a view of the concrete smoke stack during construction are given in Fig. 3. The general construction of the boiler house is uniform with that of all the other buildings, as described in the beginning of this article. Attention is

steel chutes for delivering the coal from the bunkers into the stokers may be seen in the farther end of the view. These coal bunkers, including all supporting columns, braces, etc., are entirely of reinforced concrete. It will be noted from this view that the boiler room is unusually light. This condition was obtained by having ample window space as illustrated in Fig 3, and by placing the coal bunkers high enough above the windows to prevent their shutting out the light.

This view also shows the four 375-h.p. Stirling boilers and the chain-grate stokers, all in the process of construction. Room has been provided for two additional boilers when the development of the mines warrant their installation.

There is a concrete tunnel beneath the rear of all stokers, extending throughout the length of the boiler house and a distance beyond sufficient to enable the ashes to be taken in a car directly from the ash hoppers below the stokers to a hoist outside, and thence, by an ash-handling equipment, to a dumping ground at some distance from the plant.

Coal is delivered to the bunkers from

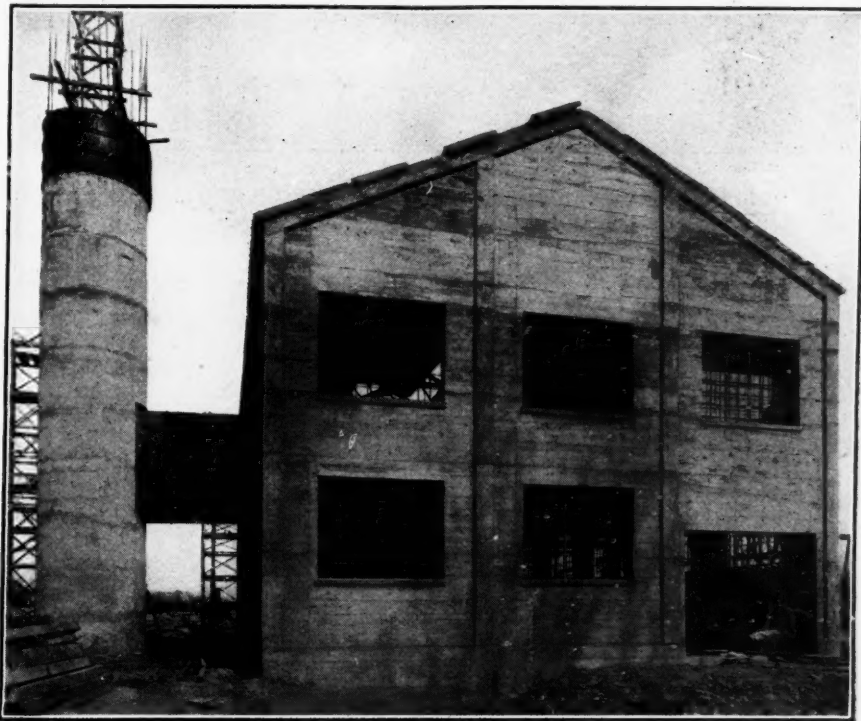


FIG. 3. BOILER HOUSE AND STACK, UNDER CONSTRUCTION

The method of constructing this stack is particularly well shown in the illustration. The materials were taken in through an opening in the bottom and hoisted up through the inside by means of the tower, above the stack. The vertical reinforcing rods are shown and also the movable forms used for holding the concrete.

An interior view of the boiler house is given in Fig. 4, which shows the coal bunkers for receiving and storing the slack coal used for feeding the boilers. The

beneath the slack screens in the tipples by coal conveyers. By the installation of these conveyers and the stokers, the coal is handled by machinery directly from the mines into the boilers without any hand labor whatever. The ashes also are handled entirely by mechanical means.

#### THE POWER PLANT

The general appearance of all the buildings composing this plant (excepting the office) is shown by the view of

the boiler house given in Fig. 3. This view shows the concrete foundations; the reinforced-concrete walls; the cement-tile roofing and the steel window frames and sash. These buildings are not intended to have any architectural features, but care was exercised in their design to make the proportions and general lines as good as possible.

Fig. 5 is an interior view of one corner of the generating room, showing two of the 250-kw. direct-connected generators, also the switchboard, some of the steam piping and the five-ton overhead crane used for handling equipment in the power house. It will be noticed that the engines driving the generators are of the four-valve Corliss type. This in indica-

building has an ample ventilator, the portion over the blacksmith shop having louvers and the portion over the carpenter and machine shops having pivoted windows. It will also be noted that the windows, instead of being made into an upper and lower sash, as is usual, have the main sash made stationary and contain two small, pivoted sashes. This is an improvement over the old arrangement, inasmuch as it enables the main sash and frame to be built into the walls and weatherproofed and leaves only a small window loose.

#### MINERS' BATH HOUSE

There is a general tendency on the part of the better class of mining companies

ties for properly washing and bathing himself. Where coal companies have provided such facilities there seems to have been a commendable spirit upon the part of the miners to make use of them.

Based on the experience of the Frick Coke Company and other fuel-producing subsidiaries of the United States Steel Corporation, the Bunsen Coal Company has taken a step in advance of other Indiana operators and provided at this plant excellent facilities in the way of a modern miners' bath house.

The building illustrated in Fig. 7 is some 32x62 ft. in size, and is built of reinforced concrete with concrete floors and cement-tile roofing. The roof is of

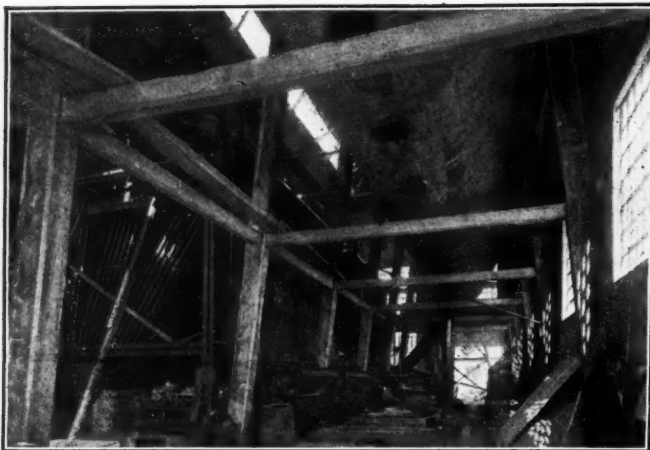


FIG. 4. INTERIOR OF BOILER HOUSE, SHOWING CONCRETE COAL BUNKERS

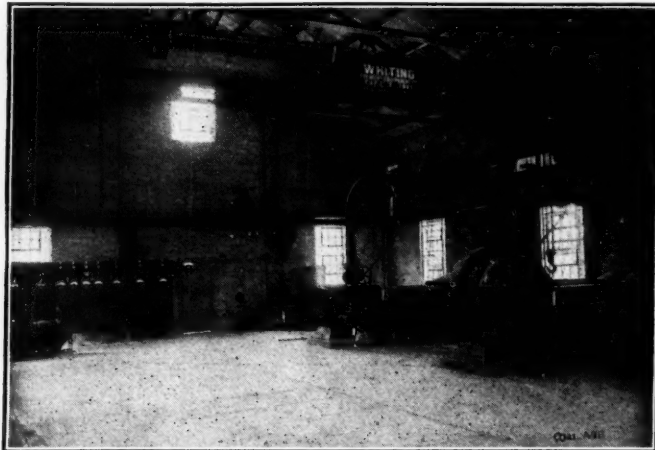


FIG. 5. INTERIOR OF POWER HOUSE, SHOWING ONE CORNER



FIG. 6. BLACKSMITH, CARPENTER AND MACHINE SHOP

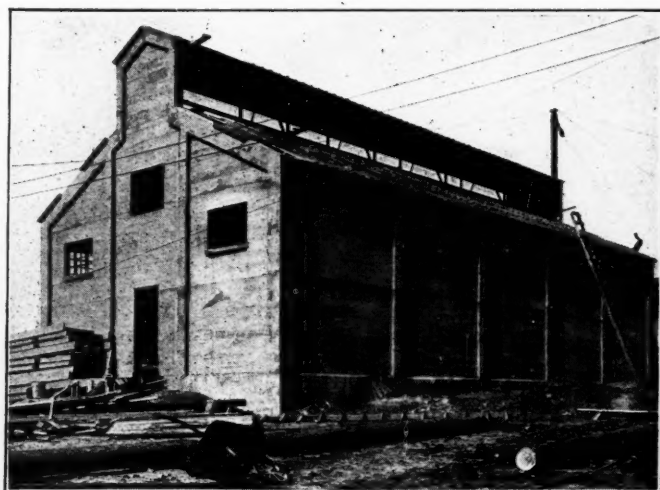


FIG. 7. MINERS' BATH HOUSE, DURING CONSTRUCTION

tive of the class of machinery and equipment used throughout the entire plant, showing that within certain reasonable limits the first cost was increased for the purpose of securing economy in maintenance and operation.

The combined shop building for the two mines, containing three compartments, one each for the carpenter, blacksmith and machine shop, is shown in Fig. 6. This

to go beyond the mere letter of the law in providing wash houses for their miners. Experience has taught that there is really small benefit to the miner in appearance or comfort, when simply provided with a wash basin and water. If he is to improve his appearance upon coming out of the mine and be presentable while passing along the streets to his home, he must be provided with facili-

open steel construction, allowing the superheated air in the building to pass up and out through ventilators. The building is provided with plain, substantial, wooden benches for the use of the men in changing clothing and with ample facilities for washing and with shower baths. The entire interior construction is such that the building may be washed out by the use of a hose and the water



drained off to the sewer. This latter facility enables the attendant to keep it always in a cleanly and presentable condition.

#### VENTILATING EQUIPMENT

The ventilation for both mines is supplied through separate air compartments forming a single shaft, as explained in the beginning of this article. The fan is a Clifford-Capell, 20 ft. diameter by 5 ft. 6 in. wide, designed to run as a blowing fan but made reversible. It is driven by a pair of four-valve Corliss type engines direct connected to the fan shaft by clutches. These engines are placed one on either side of the fan and each engine has sufficient capacity to drive the fan under ordinary working conditions. In

case of an accident to either engine the other is available; or in case of emergency, where unusual demands are made on the fan, both engines can be connected.

The casing for the fan wheel and the connection to the air shaft are entirely of steel plate. The balance of the housing, the roofs, side drifts, engine houses, etc., are entirely of reinforced concrete.

#### MINE OFFICE

In providing comforts and conveniences for the superintendent, engineer and general mining force, this company has also gone beyond the usual custom by erecting a most excellent office build-

ing. It is a two-story structure, 30x40 ft., built of cement blocks with slate roof and has a large porch on the front which gives the building a pleasing and substantial appearance.

The plain reinforced-concrete walls adopted for the other buildings were not considered appropriate for the office building, where an architectural effect was desired. The results obtained with the cement blocks are quite satisfactory.

The interior finishing and furnishings of this building are plain but substantial and in keeping with its character. The rooms are all steam heated and electrically lighted and the sleeping compartments are provided with bath, toilet, etc.

## Penn Mary Coal Mines, Heilwood, Pa.

By R. Dawson Hall

The Penn Mary mines of the coal company of the same name are remotely situated from all main lines of communication. A winding branch, designated after its terminal, Possum Glory, connects through the Cherry Tree & Dixonville Railroad with the line of the New York Central & Hudson River Railroad. The town of Heilwood is on the boundary line between Cherry Hill and Pine townships, in the center of the eastern part of the county of Indiana, Penn.

#### GEOLOGY

For the most part all over that county, the Allegheny series of coal measures lie entirely below water level and are hard to reach, but across the Indiana field is a long, irregular scar where the elevation of the measures and the erosion of the streams have combined to lay bare the upper members of the Allegheny beds, to wit, the Upper and Lower Freeports. It is interesting to note that the butt and face cleavages of the coal are not distinct. The ragged-edged scar seems to embrace both the Chestnut Ridge Anticline and the Brush Valley Syncline, together with the valleys of Two Lick and Yellow Creek and their unimportant tributaries.

The mines of the Penn Mary Coal Company are in the Lower Freeport seam. This is about 42 in. thick, but of this about six inches in the bottom is not desirable. There is, therefore, the usual difficulty in getting a large production and sufficient men. On the whole, considering the thinness of the seam and the remoteness of the town, both difficulties seem to be admirably met. The large interval of about 75 ft. between the Freeports is maintained here as in the other parts of Indiana county, though the upper measure at this place is not of workable thickness.

#### MOTORS ON STEEP GRADES

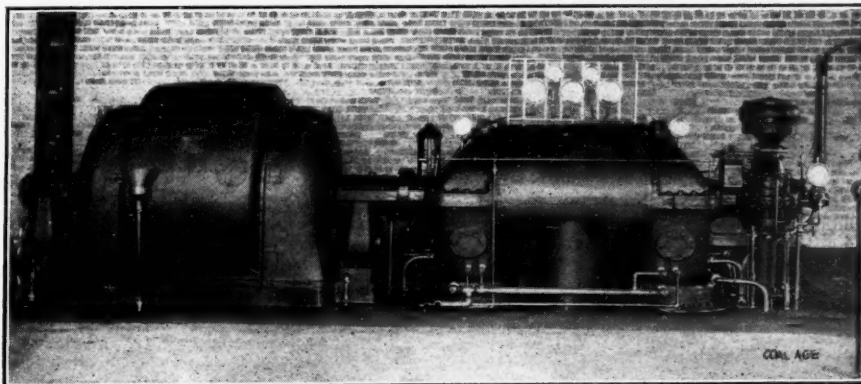
The Freeports at Heilwood are marked by awkward dips, which make drainage

*The equipment in these mines has some important features not duplicated at mining plants elsewhere. A low-pressure turbine is installed to use the exhaust steam from all the reciprocating engines previously installed at the plant.*

downgrades slacken, and, on coming out, to help pull the trip; the rope and the motor mutually aiding each other. This manner of operation is proving satisfactory. When the trip is detached from the rope the motor is ready to perform the work required on the level stretches and by using a hoist wherever needed the motor never has to double and never burns out on the heavy lifts. As many as 75 cars per trip are pulled out of Penn Mary No. 1, but only 10 can be pulled out of No. 3.

#### HEILWOOD VILLAGE

It is not the intention to describe Heilwood. It is a model town in all respects,



WESTINGHOUSE PARSONS LOW-PRESSURE TURBINE WITH GENERATOR

and haulage alike troublesome. Beside this, there are the heavy pitches away from the Nolo Axis. Thus the main haulage road of Penn Mary No. 1 dips with much irregularity on an average grade of 5 per cent., while No. 3 has a grade of 16 per cent. against the load. These uneven dips are not well suited to engine planes, though a tail-rope or a continuous-rope system might be adopted.

The method followed has been to use motors assisted by electric hoists, using the motor on entering the mine to unreel the rope and pull the cars where the

well laid out and clean. It has a hospital better than many a town of ten thousand inhabitants and in Doctor McHenry, a company physician with an enthusiasm in his work which is back of many of the provisions for the sanitary improvement of the town.

The company is now building two mine-rescue buildings, one at tippie No. 1 and one at tippie No. 2. Each building will house two Draeger helmets of two-hour capacity and one half-hour apparatus of like make. There will also be a Pulmotor in each building.

At present, tipple No. 1 is making 1200 tons per day. Tipple No. 2 drawing from 2, 3, 4 and 5 mines, handles 2250 tons. Tipple No. 3, is handling 650 tons of coal from No. 6 mine. A new tipple is to be built to handle the coal from mine No. 7. The tonnage could be doubled if necessary at these plants. The main feature of interest in the plant centers around the electrical equipment, in charge of B. F. Smith, chief electrician and master mechanic.

#### OLDER ELECTRICAL EQUIPMENT

The original equipment, constituting the direct current side of the power house, consists of four complete units, all 200-kw., 250-volt, 800-ampere generators, driven at 225 r.p.m. by four 16x18-in. Fleming engines, of the Harrisburg Foundry and Machine Works. The Rochester forced-feed oiling system is used on these engines and with this arrangement there is no risk of the attendant being burned by the bursting of sight-feed oil gages. It is said that the installation of these lubricators effected a saving of \$3 every 24 hours in the oiling of the four engines. This saving would doubtless not be as marked now as it was when the change was made, because at that time, the boilers were inadequate for the work imposed on them, the steam was therefore exceedingly wet and a large proportion of the oil used was carried off by the moisture without reaching the cylinder walls.

Each generator unit is supplied with a Vermont-marble switchboard panel and the general distributing system is protected by six Westinghouse double-pole circuit breakers mounted on four panels which are uniform in construction with the others mentioned. All the electrical machinery in use at the plant was furnished by the Westinghouse Electric and Manufacturing Company.

#### LOW PRESSURE TURBINE

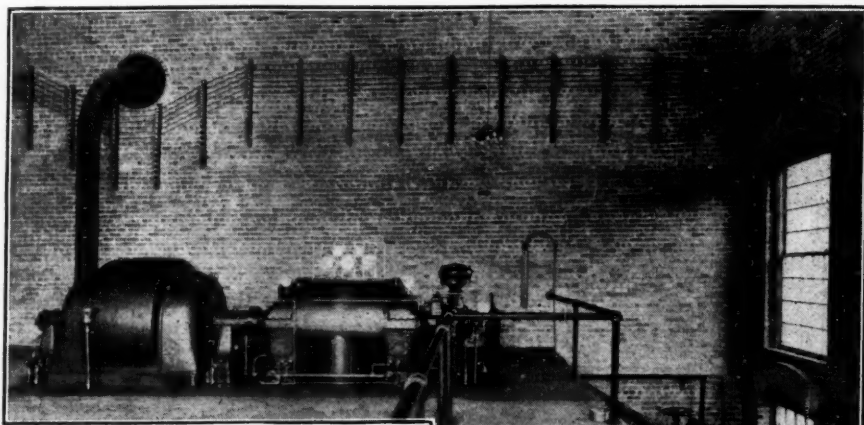
The exhaust from the high-pressure engines in the direct-current section of the power plant, together with that from all auxiliaries around the central station is conducted to a Westinghouse-Parsons turbine which drives a 3-phase, 60-cycle, alternating-current generator, mounted on the same shaft with it at 3600 r.p.m. The latter has a rated capacity of 750 kv.a., 2400 volts, and 180 amperes per terminal.

A 25-h.p., shunt-wound direct-current motor, running at 1100 r.p.m., on 250 volts and 86 amp., actuates the exciter of the turbine generator. This exciter unit is a 15-kw. generator, producing 120 amp. at 125 volts pressure.

A No. 13 LeBlanc condenser takes care of the exhaust from the low-pressure turbine and produces a vacuum of 26.5 in. of mercury, that is, the back pressure from the condenser together with the weight of a column of mercury 26.5 in.

long would equal the atmospheric pressure.

This condenser, Fig. 2, is of extremely simple construction. An illustration showing the outside appearance will be found on the front cover and a sectional view can be seen in the body of this article. A pipe *A* connects the top of the condenser with a large tank of water outside the building. This tank is termed the "cold well." The low pressure established in the condenser serves to draw the cold water continuously through the pipe *A*. The water passes through the spray nozzles *B*, mingling with the exhaust steam from the turbine which enters at *C*,



and the resulting hot water is collected in the chamber *E*.

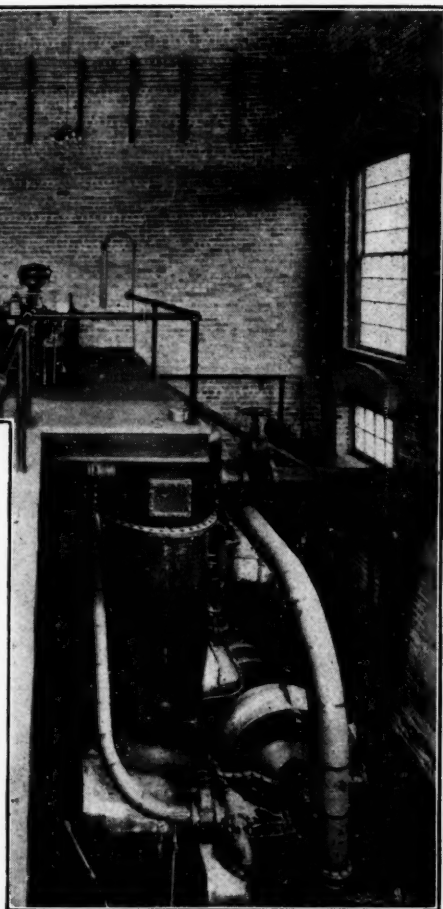
The condensation is rapid and reasonably complete, but extremely low, absolute pressures cannot be obtained by this device alone, because the exhaust steam and the cold condensing water both contain air and no simple condenser, unaided by mechanical means for removing this air, can possibly succeed in producing even an approximate vacuum.

In some systems a more complete vacuum is sought by the use of reciprocating air pumps. The objection to this method of evacuation is to be found in the necessity that always exists in a reciprocating engine to provide for a clearance space at the end of the cylinder. The LeBlanc condenser proceeds on a principle similar to that of the Sprengel air pump which is as perfect a rarefier of air as any known. Whereas in the Sprengel pump discontinuous drops of mercury in a narrow tube impel the air forward and out of the receptacle to be evacuated, in the LeBlanc pump, water is used, and the discontinuity of its discharge is obtained by the use of a wheel, section *NN*, Fig. 2., the vanes of which are filled with water from the port *H* which is in turn filled from the stationary chamber *G*.

The mixture of air and steam in the upper part of the condenser *E* is taken by the pipe *D* down past the edges of the blades of the rotor of the so called air pump *P*, which is driven in the direction of the arrow. The water driven

discontinuously from the blades of this wheel entrains the air and steam in the narrow passages *F*, into which the water is forcibly discharged. Thus an efficient vacuum is obtained. The air pump is operated by a steam turbine using live steam from the boilers. Mounted on the same shaft with both air pump and turbine is a centrifugal pump for removing water from the condenser to the hot well.

The three units are inclosed in a common case and are of a construction so simple that they can scarcely get out of order. There is a side passage *L* in the discharge *J* from the air pump by which



LOW-PRESSURE TURBINE WITH CONDENSER

steam can be admitted to start the condenser after a shutdown, but this is not necessary where, as at Heilwood, the cold well is over 3 or 4 ft. above the basement floor on which the condenser rests. It is said that the small live-steam turbine, for driving the two pumps, requires only about 2 or 3 per cent. of the power delivered by the main engines.

#### DISTRIBUTING OF A. C. CURRENT

The alternating-current switchboard consists of five panels, one fitted for two exciter units, one a blank for future development, one equipped for the present 750-kw. low-pressure turbine outfit, one equipped with two present distributing circuits and one a blank panel for use

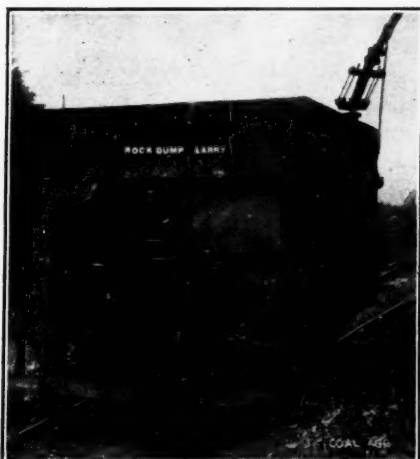


when other circuits have to be distributed. A Tirrell regulator is employed to maintain a constant voltage.

The transmission lines to the substation at tippie No. 2 are of No. 1 hard-drawn copper wire, supported on chestnut poles set 120 ft. apart. The line is protected from lightning by a No. 6 soft-drawn wire which is strung from end to end and connected to the ground at various points. This arrangement has given excellent satisfaction.

#### THE FIRST SUBSTATION

A substantial substation of brick has been erected near tippie No. 2. This



ELECTRIC ROCK LARRY. CAPACITY 10 TONS

alternating current for the town houses and street lighting, and for the fans. Ordinarily the a.c. generator can be run either in parallel with the four d.c. generators at the main station or it may be run as an independent plant.

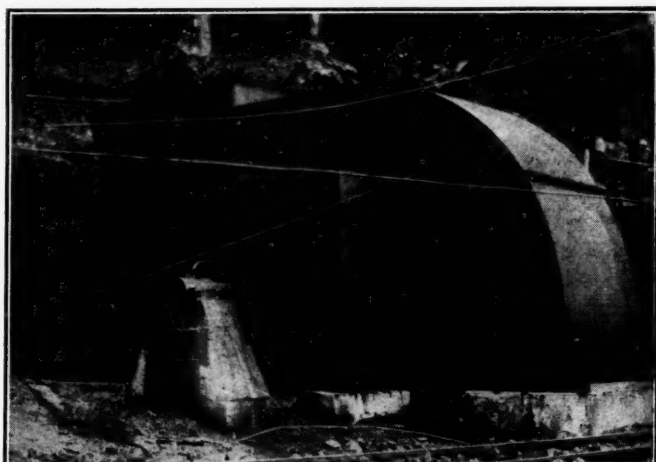
Lightning arresters with choke coils are located at the substation together with oil circuit breakers for the alternating-current lines; also a circuit breaker and switches for the direct current. All mines except No. 5 can be cut out at the switchboard of this substation. The motor-generator set is brought up to speed by running the d.c. generator as a motor and not by induction-motor action in the a.c. machine.

By regulating the field of the a.c. synchronous motor, the power factor of the circuit can be adjusted to unity. James Lytle is the acting electrician at Penn Mary, under the direction of Mr. Smith.

#### ELECTRICAL HOISTING

There are two 200-h.p., Lidgerwood hoists, a steam hoist at No. 1 and an electric hoist at No. 3.

The following tables show the cost sheets of the two latter for labor and material. The labor item does not include the wages of the operator, which is the same at the two hoists. Of course, the power cost is not considered in this estimate.



FAN NEAR TIPPLE No. 2

contains a motor-generator set consisting of a 450-h.p. synchronous motor, running at 900 r.p.m., which receives a current of 94.1 amp. per phase at 2200 volts potential and a 300-kw. direct-current interpole generator delivering 1200 amp. at 250 volts.

The exciter for this outfit is a 4½-kw. machine, rated at 36 amp. and 125 volts at 900 r.p.m. The plant is reversible. The direct-current machine can be supplied with direct current from the power station and thus drive the alternating-current motor as a generator to supply

running at 725 r.p.m. and taking 22.2 amp. at 250 volts.

#### FANS, MINING MACHINES AND MOTORS

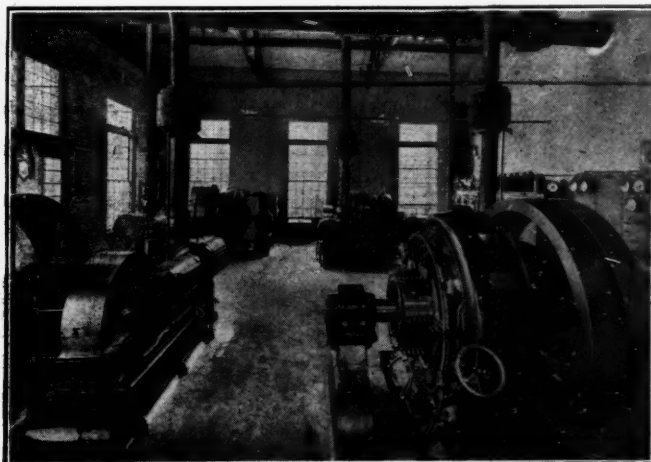
The fan at Penn Mary No. 1 is a 16-ft. Capell fan. No. 3 mine is ventilated by a J. C. Stine fan 12 ft. in diameter, driven by a 100-h.p. induction motor running at 690 r.p.m., receiving 3-phase, 60-cycle current at 2000 volts potential and 27 amp. per terminal. Electric power is being used for eight 12-ton and four 15-ton Baldwin-Westinghouse locomotives; also for thirteen Pneumelectric punchers and one Hirst electric rotary cutter, which are used for undercutting the coal. Electric pumps with wood-pipe discharge lines are installed at appropriate places in the mines.

#### BOILER EQUIPMENT

The boiler equipment consists of six 300-h.p. water-tube units, four of which are Babcock and Wilcox boilers, the other two being built by E. Keeler, of Williamsport, Penn.

The feed-water supply to the boilers is controlled by Cope boiler-feed regulators and pump governors. Under ordinary conditions the water level is so maintained by these devices that it does not vary more than an inch from the desired elevation in the boilers.

Fuel is brought to the firing floor in Ernst Weiner steel cars filled from



DIRECT-CURRENT ENGINE ROOM, HEILWOOD, PENN.

#### RUNNING COST OF STEAM HOIST

	Material	Labor	Total
August, 1911.....	\$29.19	\$23.60	\$52.79
September, 1911....	8.04	13.60	21.64
October, 1911.....	7.77	6.58	14.35
November, 1911....	2.51	0.77	3.28
Total.....	\$47.51	\$44.55	\$92.06

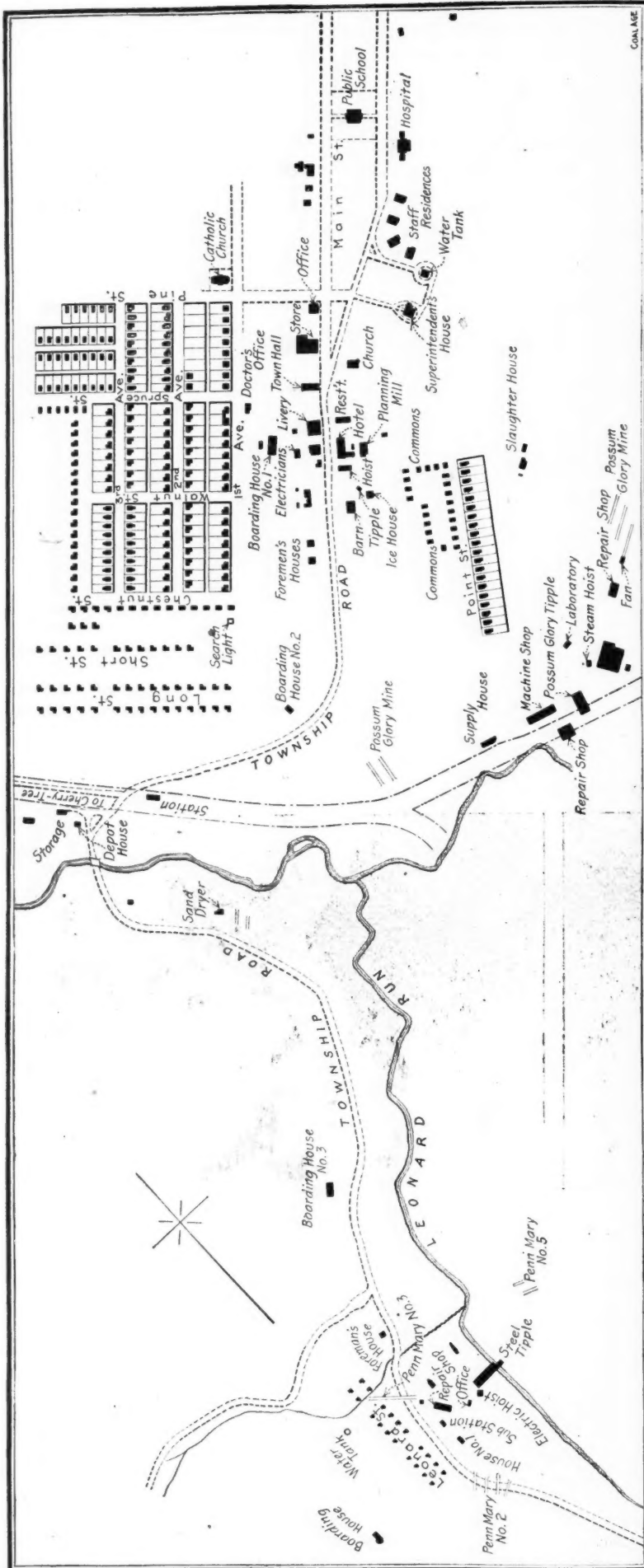
#### ELECTRIC HOIST

	Material	Labor	Total
August, 1911.....	\$4.64	\$0.00	\$4.64
September, 1911....	7.70	0.00	7.70
October, 1911.....	0.00	0.00	0.00
November, 1911....	0.00	0.00	0.00
Total.....	\$12.34	\$0.00	\$12.34

In connection with the haulage motors on steep grades, as has been mentioned, small hoists are used of 5-h.p. capacity,

chutes at the side of the boiler room; these run on tracks in front of the boilers, making the work of stoking light and keeping the space in front of the boilers clean.

Two Smith-Vaile steam pumps, 14x10 x18 in., either of which is adequate to supply the power house and town, pump water from a reservoir on Yellow creek, a distance of about 1000 feet. As an auxiliary supply two drilled wells take water from the sandstone above the "B" bed. One of the pumps is located in the boiler house and one about 100 ft. away.



MAP SHOWING LOCATION OF PENN MARY MINES AND SURFACE BUILDINGS, HEILWOOD, INDIANA COUNTY, PENN.

This last pump is arranged so that when the water in the tank reaches a predetermined level, a switch is automatically thrown which breaks the circuit to the motor by which the pump is driven. This switch is operated by a float in the tank.

#### COMPRESSED AIR

Except as used in the Pneumatic punchers, the only considerable use of compressed air at the plant is in the large machine shop of the Penn Mary Coal Company. Here, air is used to operate the power hammer, and is supplied by three standard Westinghouse locomotive-type steam-driven air pumps  $9\frac{1}{2} \times 9\frac{1}{2}$

$\times 10$  in. in size. The line pressure for the service is 75 lb. per sq.in. The air is used also to some extent for general cleaning in the power house. All the auxiliaries of every sort driven directly by live steam furnish their quota of exhaust to the low pressure turbines so that no power is wasted.

#### CHEMICAL LABORATORY

The water used is analyzed every week by the chemist, C. W. McGregor. All oils, cements, and paint used are also analysed. In preparing the coal for analysis it is ground to such a fineness that it will pass a 100 mesh, by means of a disk pulverizer, made by the Denver

Fire Clay Company. This is driven electrically by a direct-current motor of 2 h.p., running at 1200 r.p.m., and using 9 amp. at 220 volts. The grinding is performed on the face of the revolving wheel, the distance between the wheel and the friction plate being regulated by capstan screws. The coal escapes through small slots in the grinding face.

#### ROCK DISPOSAL

The question of rock disposal is made difficult by the thinness of the coal and the fact that it outcrops low down in narrow valleys. A large quantity of rock has consequently to be taken a long way from the drift. The rock is dumped

from the tippie into a large 10-ton electric larry. This larry has a bottom sloping toward the two sides and also toward the rear end. It is run backward onto the dump. Large doors on the sides and rear of the larry are opened by a simple lever, and once released the rock falls without further assistance from the car, unloading in three directions.

#### BLACKSMITH SHOP

A large blacksmith shop is equipped for the manufacture of mine cars and for all simple repairs to machinery. As a guide to those who may have to equip such a shop the following figures are given. The shop measures  $32 \times 138$  ft.



The motive power is furnished by a 30-h.p. motor, run at 600 r.p.m. on 115 amp. and 220 volts. The plant includes:

One 22-in. x 10-ft. lathe for general work.  
 One 26-in. x 12-ft. lathe for turning axles.  
 One 38-in. x 16-ft. wheel-turning lathe.  
 One 18 in. x 5-ft. planer.  
 One 25-in. radial drill press.  
 One 30-in. radial drill press.  
 One 5-ton air hammer.  
 One bulldozer for preparing car irons.  
 One 14-in. power hacksaw.  
 One combination shear and punch.  
 One pipe machine to cut and thread from 1 1/4- to 6-in. pipe.  
 One 1-ton triplex block in car-repair shop.  
 One 1-ton Triplex block in machine shop.  
 One 2-ton Triplex block in machine shop.  
 One double-spindle, 14-in. emery-wheel stand.  
 One 3-ft. grindstone.  
 Two forges, one driven by a 30-in. Buffalo blower and one by an 18-in. Champlon blower.  
 One heating furnace for preparing iron for the bulldozer.  
 And for woodworking:  
 One 36-in. band saw.  
 One 14-in. rip saw.  
 One 16-in. cutoff saw.

The machine shop, while in general charge of Mr. Smith, is under the direct supervision of William G. Davis.

pation of these further developments that the a.c. electrical installation was provided.

## Winter Meetings of the Mining Institutes

The West Virginia Coal Mining Institute will hold its winter meeting at the Masonic Temple, Fairmont, W. Va., on Dec. 4, 5 and 6. The program includes a number of addresses on subjects of great interest to the coal-mining, fraternity in general as well as several dealing with more particularly local matters. An interesting feature of the meeting will be the tour of inspection to the coal mines and industrial plants in the neighborhood of Fairmont, on Wednesday Dec. 6, under the auspices of the Fairmont Chamber of Commerce.

The following addresses will be given: "A Mine Foreman," John Laing, chief of

Dr. Thos. C. Hodges, president, West Virginia University, Morgantown, W. Va.; "A History of the Fairmont Region," Ex. Gov. A. B. Fleming, Fairmont, W. Va.; "The Recovery of Coal from the No. 2 Gas Seam, in the Kanawha District," James J. Marshall, chief engineer, Loup Creek Colliery Company, Page, W. Va.; "The Economical Production of Steam in the operation of Coal and Coke Plants," Chas. N. Hays, Pittsburg, Penn.

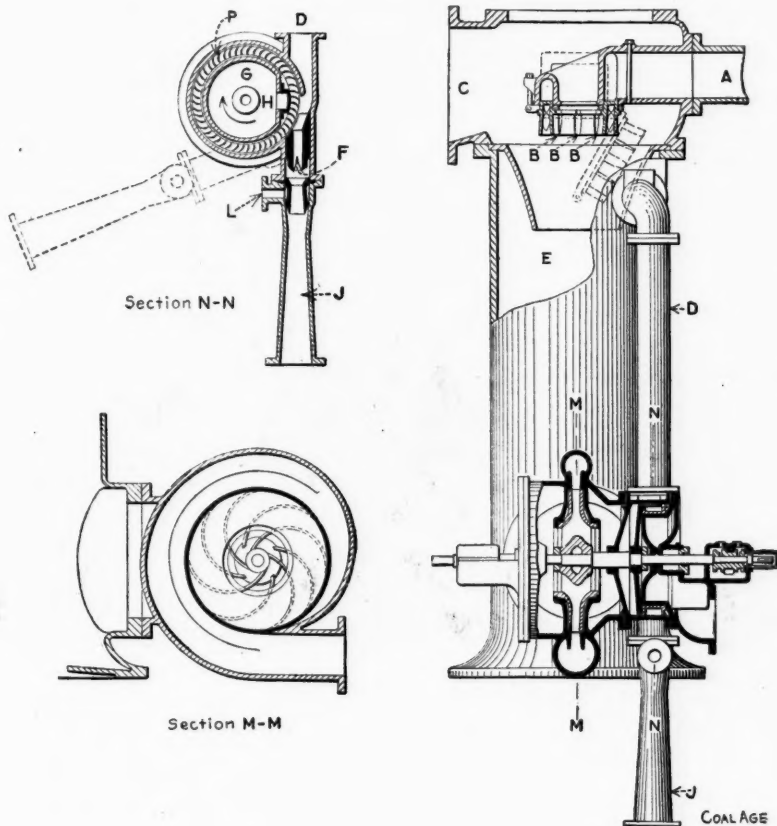
On Monday, after the president's address, Judge W. S. Haymond and Hon. E. M. Showalter will welcome the Institute. Five minute responses will then be in order from a number of prominent members. The Fairmont Chamber of Commerce will tender a banquet on Tuesday, Dec. 5. Frank Hass, Fairmont, W. Va., is president of the Institute and E. B. Day, Pittsburg, Pa., is secretary-treasurer.

### COAL MINING INSTITUTE OF AMERICA

On Dec. 19 and 20 a joint session of the Coal Mining Institute of America and The Engineers' Society of Western Pennsylvania will be held in the rooms of the latter organization, Oliver building, Pittsburg, Penn. This is the regular winter meeting of the mining institute.

Addresses will be delivered by Walter Riddle, Ph. D., president of the Engineers Society, and by S. A. Taylor, president of the mining institute. Mr. Taylor's subject will be "The Coal Fields of the World, with Some Statistics and Data Thereon," and will be illustrated by stereopticon. The institute dinner will take place in the evening of Dec. 20, at the Seventh Avenue hotel.

The following papers will be presented: "Power Plants with Special Reference to Requirements in Western Pennsylvania" (illustrated with lantern slides), O. S. Lyford, Jr., R. W. Stovel, engineers with Westinghouse, Church, Kerr & Co., New York City; "A Remarkable Coal Formation," Jesse K. Johnston, Charle-roi, Penn.; "Special Methods of Testing for Mine Gases," W. R. Crane, Ph.D., dean The School of Mines, Pennsylvania State College; "The Construction and Maintenance of Telephone, Signal and Trolley Lines in Mines," E. M. Weir, Western Electric Company; "Application of Gas Analyses in Coal Mines," G. A. Burrell, chemist, U. S. bureau of mines; "The Price of Coal Compared with the Price of Materials Used in Mining," E. N. Zern, assistant professor of coal mining, University of Pittsburg; "Electrical Symbols for Use on Mine Maps to Indicate the Character and Location of Electrical Apparatus," H. H. Clark, electrical engineer, U. S. bureau of mines; Mr. Randolph, of Wood & Randolph, electrical engineers, Pittsburg; "Lignite Mining in Colorado," C. J. Griswold, assistant professor of mining, Carnegie Technical School, Pittsburg.



SHOWING DETAILS OF THE LE BLANC CONDENSER

The general management of the operation is in the hands of H. P. Dowler, assisted by M. H. Kalloway. The mining engineering is directed by John T. Hoover. To these and all those whose names have been already mentioned I desire to make acknowledgment for assistance in preparing this article.

The railroad is being extended to tipples 3 and 4, and some time next spring these important additions to Penn Mary will be shipping coal. It was in antici-

the department of mines, Charleston, W. Va.; "Forestry for Mining Companies," R. C. Eggleston, forester, Consolidation Coal Company, Jenkins, Ky.; "The Relationship of Manufacturer to Operator," F. C. Albrecht, E. E., Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.; "A Method of Testing for Black Damp," W. R. Crane, E. M. Dean, School of Mines, Pennsylvania State College, State College, Pa.; "Technical Education with Special Reference to Mining Interests,"

# Coal Mining Methods in Michigan

By R. B. Hosken\*

From an economic standpoint, Michigan is a small factor as a coal-producing State. In 1909, its production, about a million and three-quarters tons, placed it twenty-third in the list of coal-producing States, below Montana, Arkansas, Utah and Texas. In 1910, the tonnage was reduced to 1,473,874, and but 2474 workmen were employed in this industry.

The student of coal-mining conditions and methods, however, can well afford the time needed for a closer glance at the Michigan situation than these figures would seem to warrant. With the exception of the extreme northern part of the Appalachian region, the Michigan coal-field is the only one within the drainage area of the Great Lakes. It covers some

*An interesting description of mining methods in Michigan in which the use of machines in low seams is discussed. The coal beds range from 26 to 42 in. in thickness and have a poor roof. Unusually large quantities of water are encountered.*

\*Engineer, 1459 Olive avenue, Chicago, Ill.

The depths of the seams from which the heaviest production now comes, are from 130 to 175 ft. The beds overlying the coal are chiefly weak black shales, making poor roof. Black bituminous limestone, full of shells, or wet sandstone are also found as roof. The bottom is usually fireclay or a soft sandstone, and the mines, as a rule, lie beneath low ground and are wet.

The coal itself varies considerably in hardness. In some mines it is soft and friable, breaking up easily. In other portions of the same bed where the seam is thinner, the coal is much harder, and rolls out in firm blocks, after being undercut.

The seam which is especially consid-

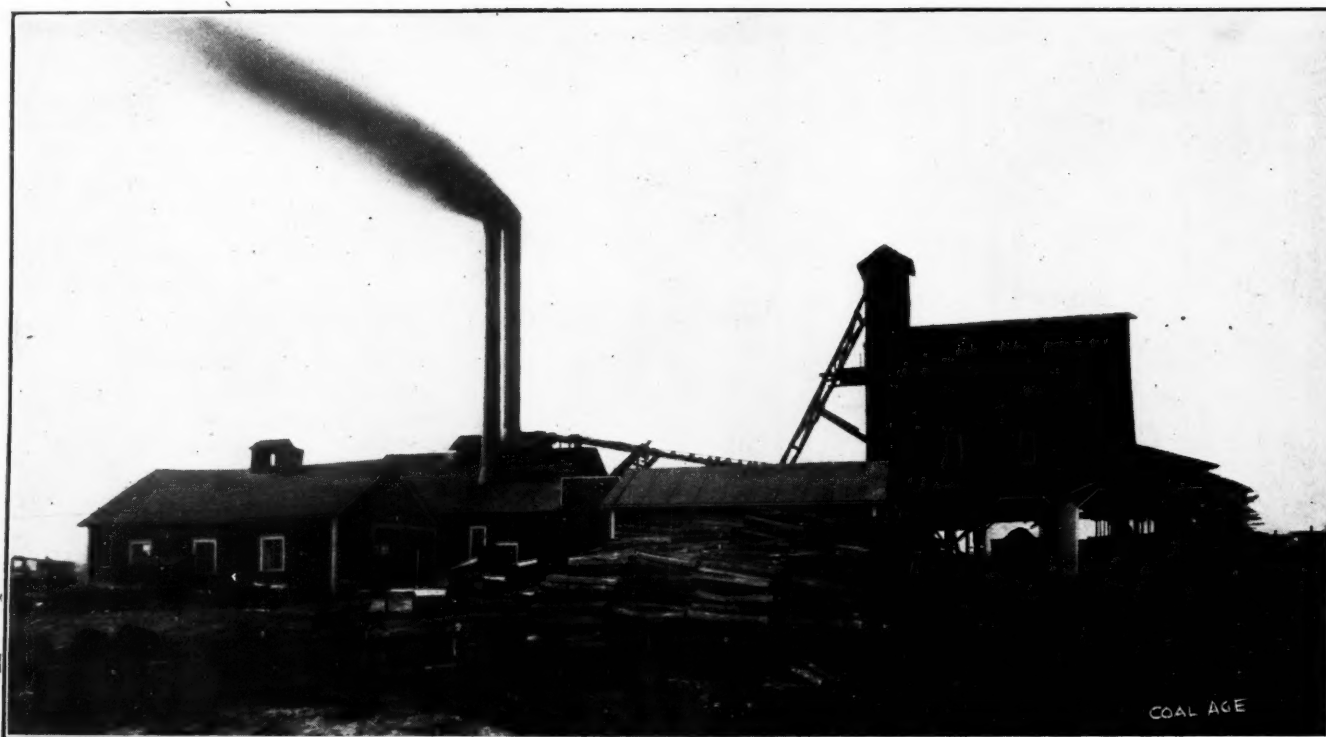


FIG. 1. POWER HOUSE AND TIPPLE AT BEAVER MINE, BAY CITY, MICH.

6500 to 8000 square miles, the seams having an average thickness of about 26 in. No coal is mined less than 2 ft. thick at present, and of this there are estimated to be about eight billion tons still unmined. Active mining is confined to the eastern portion of the field in a line drawn between Bay City and Jackson; and Bay and Saginaw are the two counties in which the bulk of the coal is produced. Small tonnages are credited to Clinton, Eaton, Genesee, Ingham, Jackson, Shiawassee and Tuscola counties.

Coal mining was reported in Michigan as early as 1835; but for many years wood remained the chief fuel for both domestic and industrial purposes. It was 1898 before the tonnage rose to the quarter million mark, and the maximum output thus far was that of 1907, amounting to a little

over two million tons. Development has been slow, and no very great increase can be looked for, owing to the competition encountered from West Virginia and other larger fields. Nearly the entire production of the State is used locally, therefore, and some of the mines operate only during the fall and winter months, when the domestic trade affords the best prices.

## GEOLOGY

Geologically, Michigan coal seams are correlated with the Lykens Valley group of the Pottsville series and the lower carboniferous formation in Pennsylvania and Ohio. The beds vary greatly in different parts of the field. They lie horizontally, but in some cases local undulations, called "rolls" or "swamps," are found, which increase the difficulty of mining.

ered in this article is about 145 ft. from the surface, and the following is an average analysis: Specific gravity, 1.26; moisture, 10.67; volatile matter, 33.59; fixed carbon, 53.80; ash, 1.94; sulphur, 1.01; British thermal units, 13,000.

It will be seen from this rough summary that mining problems and methods will vary in detail in nearly every mine. In general, however, the method of operation is uniform.

## SYSTEM OF MINING

The mines are opened by double-compartment hoisting shafts with an air shaft 300 to 500 ft. distant. In this latter there is a separate manway or escapeway compartment with spiral staircase.

The underground workings are laid out on the double-entry system, with a pillar



18 to 25 ft. thick between the haulage road and the air course, which are from 8 to 15 ft. in width and from 5 to 6 ft. high (necessitating brushing the roof and lifting bottom). Crosscuts are made at intervals of 40 or 50 ft. These are closed up and made airtight as the entry advances, to maintain proper circulation of air. Cross entries and air courses are driven at right angles to the main entry, 300 to 400 ft. apart.

Rooms are turned from the cross entries on 40-ft. centers, and in machine-operated mines are carried 30 ft. wide. They are driven 150 to 200 ft. deep to meet the corresponding room from the next succeeding entry. Breakthroughs for ventilation between rooms are 6 ft. wide, and are spaced not over 60 ft. apart. The room necks are 8 ft. wide. They are kept in good order and especial care is given to the haulageways. These are timbered with crossbars in the entries, and in rooms, when necessary. The curves are

of the workings. In the No. 2 mine of the Robert Gage Coal Company, at St. Charles, the trips are hauled from partings on the cross entries to the bottom by electric locomotives. Rope haulage is employed at the No. 5 mine of the same company, at Auburn. Self-dumping cages deliver the coal direct to shaker screens.

#### MINES HAVE POOR ROOF

As already noted, mining in this field is handicapped by poor roof, a large amount of water and thin seams, which range from 26 to 42 in. in height. Timbers must be placed at frequent intervals and brought close up to the working face; and with drainage represents a heavy charge on the tonnage mined. One mine in particular is obliged to keep an 8-in. discharge pipe running full most of the time, to keep the mine dry enough to be worked.

The pictures illustrating this article

rest of the seam is shot out. In other cases, the machines cut through the sulphur, as will be described later.

In order to make coal mining a paying investment under such conditions, the operator must employ the most economical means possible to win the coal. In early days the coal was undercut by hand pick. Pick machines were introduced in 1898, but have not been extensively adopted. Eighty-five machines, including a few of the chain-breast pattern, were used in 1904, when 23.09 per cent. of the total product was mined by machine. By this time hand-pick cutting had practically disappeared, and the remaining 77 per cent. was won by shooting from the solid, a dangerous practice and a wasteful one, on account of the high proportion of slack coal produced by the heavy powder charges necessary. In the year ending Dec. 1, 1910, 561,688 tons out of a total of 1,473,874 were mined by machines, or 38.1 per cent.

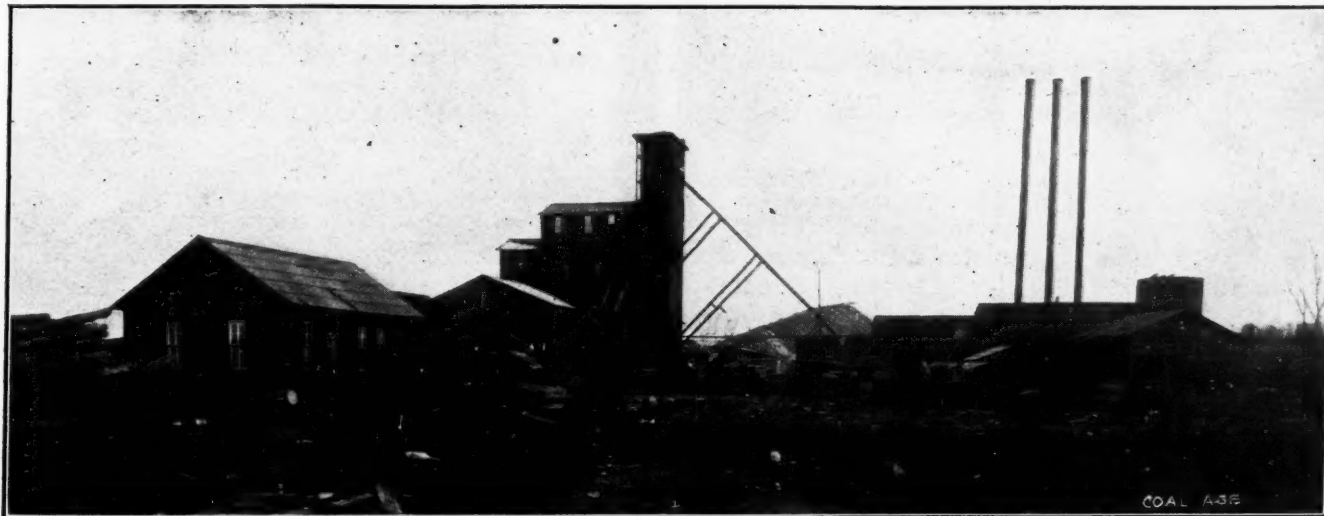


FIG. 2. THE BLISS COAL COMPANY'S PLANT AT SWAN CREEK, MICH.

carefully laid, to prevent delays to cars or mining machines.

#### VENTILATION AND HAULAGE

Blowing fans of various patterns are used in the Michigan field. Slow-speed types are the rule, as the mines are not sufficiently developed to make the ventilation problem a large one. The air current is forced down the air shaft, through the air courses and working places, and back via the haulage road to the hoisting shaft, which is, therefore, the upcast. This arrangement is a convenient one, as it keeps the hoisting shafts free from ice in the winter months. The current is usually reversible, in case of emergency, by opening and closing doors in the fan casing.

The pit cars are of wood, and hold from 750 to 1000 lb. of coal each. They are pushed to and from the face in the rooms by hand, and collected in the entries and hauled to the shaft bottom by mules. Power haulage has not been generally adopted as yet, because of the small area

were taken in the Beaver mine, about 6 miles southwest of Bay City, and at the Bliss mine, at Swan Creek.

The photograph showing the machine cutting across the face was taken in one of the driest rooms in the district; even so, trouble was experienced in keeping the flash powder dry enough to enable a good picture to be taken. In taking the picture of the machine just ready to sump under the face, the camera tripod had to be placed in about 3 in. of water. This place is about the wettest being worked at this time, and the dripping from the roof causes no little annoyance to the miners and makes the haulage roads hard to keep up.

Undercutting is usually done in the coal itself, as neither the gritty fireclay nor the sandstone bottom which sometimes replaces it, is suitable for mining. A sulphur band near the bottom of the seam gives trouble in some mines, and makes it necessary to cut above the sulphur and lift the bottom coal after the

#### CONTINUOUS CUTTERS

In the last two years, the situation has been changed materially by the introduction of electric chain machines of the Sullivan continuous-cutter pattern. The chain-breast type was less satisfactory than these, because the machine occupied so much room in front of the coal that props had to be moved and replaced to permit its passage, while the rear jack, forced into the roof at frequent intervals, constituted an added danger from falling top. The bulk and weight of breast machines and the severe labor connected with handling them in such low coal, also proved a serious handicap. The typical advantages of the continuous cutter are of great value in this field.

The Sullivan class "CE6" low-vein machine is the pattern in principal use. More than 80 per cent. of the chain machines now actually at work in this field are of this type and make. This machine stands only 21 in. high when cutting,

and 30 in. high on its power truck. Props can be set less than 6 ft. from the working face, and need not be moved while the machine is cutting. The cut made by these machines is a clean kerf  $4\frac{1}{2}$  in. high, and perfectly free, without sprags at the back, while a square working face is left for the next cut. But little powder is needed for shooting, so that not only is the roof left unshaken, but very little coal is wasted in cutting. The proportion of lump coal is much higher than that obtained by any other method.

The Sullivan continuous cutter is shown in operation in the accompanying illustrations, taken in the Beaver mine. The machine in Fig. 4 was unloaded in the room neck, which in this case was at the left side of the room. A jack was set at the end of the

with pick points are used altogether. In coal that is clean and soft, the most rapid progress is made with chisel-pointed bits. In both the Beaver and Bliss mines, sulphur occurs near the bottom of the seam in sheets  $\frac{1}{2}$  to  $\frac{1}{8}$  of an inch thick. A combination of the two styles of bits is used here, the proportion of chisel points increasing when more impurities are met, in order to protect the cutter chain from the file-like cutting of the sulphur sheets.

These machines load themselves on their trucks, unload and propel themselves in all operations on and off the truck, under their own power. This is a very important advantage in the low head room available, where lifting and moving heavy machines is handicapped by the cramped space in which the men must work.

plate ventilating fan. The mine is equipped with a steam hoist and a steam-driven electric generator for lights and power. Well appointed machine and blacksmith shops enable equipment to be kept in constant repair. A company store is maintained for the convenience of the employees.

The labor in the Michigan field is of a high class and the men are all members of the union. The basis of payment is \$1.01 per ton for all coal shot from the solid which will pass over a  $\frac{7}{8}$ -in. diamond bar screen. The slack which falls through the screen is not credited to the miner. When machines are used, the percentage of slack is smaller and the miner has little dead work to do. The wage scale in machine mines give 59c. per ton of screened coal to the loader, and 19c. to the machine runner and his

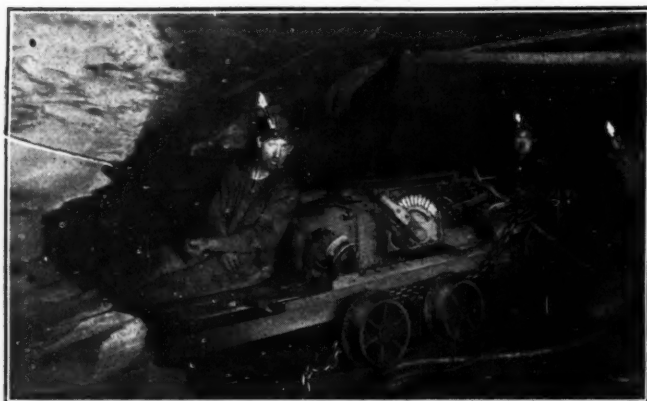


FIG. 3. MACHINE LEAVING ROOM ON SELF-PROPELLING TRUCK

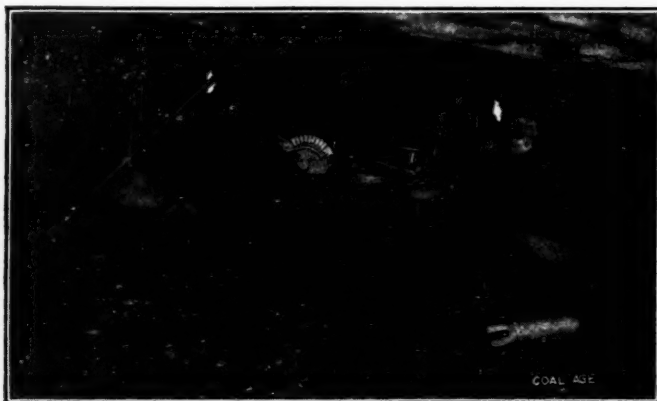


FIG. 4. SULLIVAN MACHINE CUTTING ACROSS THE FACE

right rib nearest the entry, and the machine pulled itself along the floor to this point on its feed chain.

#### UNDERCUTTING THE COAL

The rib and the face were then cut in one operation, with no other hand labor than that involved in setting the anchor jack and the takeup rig when the corner was reached, and in shoveling out the coarse cuttings from the cut behind the machine. In the picture the machine is part way across the face. The anchor jack is set to hold the feed chain and the machine with it, a little away from the face, to square it up, as it was being cut by machine for the first time. The mining is 5 ft. 3 in. deep. This particular machine was equipped with feed gears which propelled it along the face on its chain at the rate of 15 in. per minute. The room was mined in less than an hour, including 60 ft. of undercut, unloading, handling, and reloading the machine on its power truck, for transportation to the next working place, as shown in Fig. 3.

Practice regarding cutter bits varies in different mines. In the Sullivan machine, the bits are staggered in five positions or rows. In clean, hard coal, bits

#### THE BEAVER MINE

The Beaver mine is operated under the same management as the Robert Gage Coal Company, and is one of the oldest openings in the district. Owing to natural difficulties, such as the sulphur referred to above, and the large amount of water encountered, as well as lack of capital, it has never passed the development stage. The present owners are attacking their problems in a systematic and intelligent manner, and the methods they have adopted promise to overcome the difficulties and place the mine on a paying basis. At present, the Sullivan machines are used almost entirely in development, cutting entries and room necks and widening rooms. When enough working places have been squared up to provide cutting for all five Sullivan machines, the mine will become quite a factor in the production of the district.

The Robert Gage Coal Company and mines under the same management now employ about 20 Sullivan continuous coal cutters.

The surface equipment of the Beaver mine, shown in Fig. 1, is adequate to handle a large tonnage and is up to date in all respects. It includes a modern steel-

helper, or a total of 78c., which, deducted from the hand-mining rate, leaves a margin of differential for the operator of 23c. per ton. This is an inducement for machine mining, aside from the greater value realized from the output.

The men are paid off twice a month. Because of the proximity of the mines to towns and cities, the mining camp customary in other fields is generally lacking. The mine buildings stand in flat, rather desolate, fields, aloof from the other signs of civilization. The men live in Bay City, St. Charles or Saginaw, where their families can enjoy schools and other advantages. They go to and from the mines each day by train. Most of the mines in this section run wash rooms for the miners, where the men can leave their pit clothes to dry. An attendant keeps the building clean, sees to drying the clothes, and provides hot water, towels, soap, etc. For these conveniences a charge of 4c. or 5c. per day is made.

I am indebted to the mine officials of the Beaver Coal Company and of the Bliss Coal Company for photographs and for assistance rendered in preparing this article.



# Determination of Meridian

By D. J. Browne\*

*This method permits Polaris observations to be taken at any hour of the night, and offers an easy graphic method of computing the results.*

\*Mining engineer, Rossland, B. C.

NOTE—From *The Engineering and Mining Journal*, Nov. 11, 1911.

The mine surveyor, in the course of his work, is often called upon to determine meridian, especially when surveying at remote places out of convenient reach of established survey lines. In such a case, unless he is prepared with the data necessary for one of the solar methods—and these need an accurate knowledge of the time and current tables of solar declination, both of which may be difficult to obtain at short notice—the remaining methods at his disposal are limited to two or three, all based on stellar observations. The best known of these are: (1) Method of equal altitudes, and (2) Observation of Polaris, or another star, at elongation. Both methods are satisfactory, and their accuracy is limited only by the care taken and fineness of instrument employed; but either may entail the disagreeable necessity of an all-night session, with the risk of failure, should a cloud intervene at a crucial moment.

This risk is obviated by the following method, in which the position of the pole is determined by two or more observations on Polaris (in northern latitudes). These may be taken at irregular intervals, at the will of the surveyor; a useful feature, if, owing to clouds, the star cannot always be seen. The only data needed are the polar distance of Polaris, and the approximate latitude of the observer. Between latitudes 25 and 50 deg., knowledge of the latitude to the nearest quarter degree is sufficiently accurate for this purpose.

The polar distance of a star is its angular distance, on the celestial sphere, from the pole. The polar distance of Polaris on Jan. 1, 1911, was 1 deg. 10.1 min., and it is lessening by about 19 sec. each year.

## METHOD OF OBSERVATION

The field operations are as follows: Set up the transit over a hub of a permanent kind in a spot sheltered from the wind, and with an unobstructed view of the northern heavens. Then, with the horizontal vernier clamped at zero, back-sight to another station 100 ft. or more away, the position of which should be precisely indicated by an illuminated plumbline centered over it. Set the lower clamp, reverse the telescope and sight Polaris, following the star with both vertical and horizontal tangent screws until it is at the intersection of the cross-wires, so that both altitude and azimuth can be read. Note the time and read both circles. Then, after an interval of one hour or more, make a second observation.

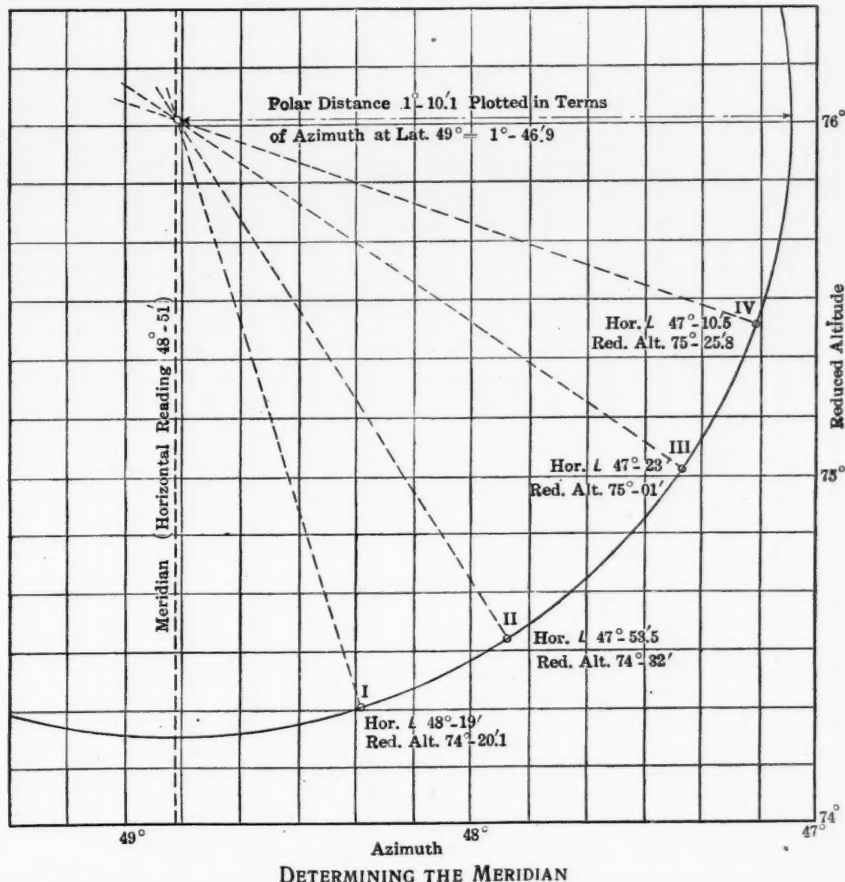
Theoretically, all the data necessary for determining the position of the pole have now been obtained, but in practice

it is desirable to make at least two more observations, as a check against errors of manipulation and to eliminate partly any faulty adjustments of the instrument. With the latter object in view, make the

to move round the pole, and this has been done by fixing two or more points in it. The radius of this circle is the polar distance of the star, and as this distance is an angular one, the problem of finding the center belongs to spherical trigonometry. Polaris, however, is so close to the pole, and consequently involves so small a portion of spherical surface in its apparent orbit, that the methods of plane geometry may be used without introducing appreciable error. The task of reducing the observations, therefore, becomes the simple one of finding the center of a circle, given two points in its circumference, and its radius.

## GRAPHIC SOLUTION

This may be easily and quickly done graphically, especially if squared paper be used, by plotting the horizontal com-



first pair of backsights with the telescope direct, and the last pair with it reversed. The main source of error, to be corrected by this means, lies in the horizontal axis of the instrument, particularly in high latitudes where there is a great difference in elevation between backsight and foresight, owing to the greater altitude of the pole.

The object has been to find the position, relative to the survey line, of the circular path in which Polaris appears

ponents of the points on the circle as abscissas, and the vertical components as ordinates, first reducing the radius, or polar distance of the star at elongation, to terms of azimuth. In explanation of this, it should be pointed out that polar distance is measured in a plane either containing, or parallel to, the earth's axis; and that in consequence, it is not the same angle as the azimuth of the star at elongation, except at the equator. The relation for any latitude is:

*Sine azimuth = sine polar distance ÷ cosine latitude.*

Hence it follows that the azimuth of a star at elongation is variable with the latitude, and increases as the observer goes north, until a latitude equal to the complement of the polar distance is reached when it would be N. 90 deg. E., or N. 90 deg. W., according as the star is in eastern or western elongation.

#### DETERMINING PATH OF POLARIS

Now, a little consideration will show that the horizontal and vertical readings

TABLE OF MEAN REFRACTIONS

Computed from barometer 30 in.,  
and temperature 50 deg. F.

Altitude	Refraction		Altitude	Refraction	
Deg.	Min.	Sec.	Deg.	Min.	Sec.
10	5	19	20	2	39
11	4	51	25	2	04
12	4	28	30	1	41
13	4	07	35	1	23
14	3	50	40	1	09
15	3	34	45	0	58
16	3	20	50	0	49
17	3	08	60	0	34
18	2	58	70	0	21
19	2	48	80	0	10

of the transit, if plotted to the same scale, will indicate the apparent path of Polaris, not as a circle, but as an ellipse. This is because the abscissas represent azimuths and not horizontal components, or projections of polar distance, while the ordinates, or altitudes, are true verti-

sec., which is all that is usually required of the mine surveyor, it is not necessary to apply the correction for refraction at latitudes higher than 10 deg., as a glance at the following table of mean refractions will show:

As there is little more than 2 deg. difference in altitude between the upper and lower culminations of Polaris, the correction for refraction is, for our purpose, the same for all positions of the star. If, however, the observations have been made with the double object of determining both azimuth and latitude, it is hardly necessary to say that the correction must be applied.

#### EXAMPLE OF THE PROCESS

The following is a practical example of the method:

Latitude of observer, 49 deg. N.

Date, Jan. 1, 1911.

Polar distance of Polaris, 1 deg. 10.1 minute.

The instrument was a 4-in. mine transit, with full vertical circle, both circles reading to minutes and by estimation to half minutes. Four observations were made, at intervals varying from 1 to 1½ hours, first backsighting to a station situated about 100 ft. to the southwest, inverting the telescope, and turning a left deflection angle to Polaris. The first pair of backsights were taken with the tele-

#### REDUCED FIELD NOTES

Observation No.	Time	Horizontal Angle	Observed Altitude	Reduced Altitude (Altitude X azim. at elong.)	
				polar dist.	
		Deg. Min.	Deg. Min.	Deg. Min.	
1	7:10 p.m.	48 19	48 44½	74 20.1	
2	8:10 p.m.	47 53½	48 52½	74 32	
3	9:40 p.m.	47 23	49 11½	75 01	
4	10:40 p.m.	47 10½	49 28	75 25.8	

cal components of polar distance. Therefore, in order to restore the circular form to the orbit, the altitudes must be plotted to a scale greater than that of the azimuths according to the ratio, azimuth at elongation ÷ polar distance. Thus, if a length of 3 in. represents 1 deg. of azimuth, then 1 deg. of altitude should be represented by a length of 3 in. X azimuth ÷ polar distance. When, however, the latter scale is such as to be difficult to adapt to prepared squared paper, plot instead the product, altitude X azimuth at elongation ÷ polar distance (preserving its angular form of degrees and minutes) on the ordinate axis, 1 deg. of this "reduced altitude" being drawn to the same scale as 1 deg. of azimuth. The observations having been plotted in this way, find the center of the circle, or the pole, with dividers or compass set to a radius representing azimuth at elongation.

When working to an error limit of 30

scope direct and the last pair with it reversed. Then, after calculating azimuth at elongation as follows:

$$\begin{aligned} \text{Sin. azimuth} &= \frac{\text{sin. polar distance}}{\text{cos. latitude.}} \\ &= \frac{\text{sin. 1 deg. 10.1 min.}}{\text{cos. 49 deg.}} = \\ &\quad \text{sin. 1 deg. 46.9 min.} \end{aligned}$$

$$\text{Log. sin. 1 deg. 10.1 min.} = 8.309410$$

$$\text{Log. cos. 49 deg.} = 9.816943$$

$$\text{Log. sin. 1 deg. 46.9 min.} = 8.492467$$

the vertical reading at each observation was reduced to the form necessary for plotting, as shown below:

The third and fifth columns were plotted on squared paper as abscissas and ordinates, respectively, with the result seen in the accompanying diagram, the scale being 1 in. to 20 min. Then, with compass set to a radius representing 1 deg. 46.9 min., the position of the pole was found by the intersection of arcs drawn with centers at each plotted point in turn. Its azimuth reading was angle,

left 48 deg. 51 min.; hence the bearing of the survey line from back station to instrument was N. 48 deg. 51 min. East.

## World's Production of Coal

The total coal production of the world in 1910 was approximately 1,300,000,000 short tons, of which the United States contributed about 39 per cent. This country has far outstripped all others, and in 1910, according to the United States Geological Survey, it exceeded Great Britain, which ranks second, by over 200,000,000 tons. Great Britain's production in 1910 was less than 60 per cent. of that of the United States, and Germany's was less than half. The increase in both of these countries in 1910 over 1909 was comparatively small, whereas the increase in the United States was nearly equal to the entire production of France and was more than the total production of any foreign country except Great Britain, Germany, Austria-Hungary and France.

The United States has held first place among the coal-producing countries of the world since 1899, when it surpassed Great Britain. In the 11 years since 1899 the annual output of the United States has nearly doubled, from 253,741,192 short tons to 501,596,378 tons, whereas that of Great Britain has increased only 20 per cent.

The following table shows the coal production of the principal countries of the world in 1910, except those for which only the 1909 figures are available.

#### THE WORLD'S PRODUCTION OF COAL, IN SHORT TONS

United States (1910).....	501,596,378
Great Britain (1910).....	298,007,699
Germany (1910).....	245,043,120
Austria-Hungary (1909).....	54,573,788
France (1910).....	42,516,232
Belgium (1910).....	26,374,986
Russia and Finland (1910).....	24,967,095
Japan (1909).....	16,505,418
Canada (1910).....	12,796,512
China (1909).....	13,227,600
India (1909).....	13,294,528
New South Wales (1909).....	7,862,264
Spain (1909).....	4,546,713
Transvaal (1910).....	4,446,477
Natal (1910).....	2,572,012
New Zealand (1909).....	2,140,597
Mexico (1909).....	1,432,990
Holland (1909).....	1,235,515
Queensland and Victoria.....	1,119,708
Italy (1909).....	611,857
Sweden (1909).....	272,056
Cape Colony (1909).....	103,519
Tasmania (1909).....	93,845
Other countries.....	5,236,903

Total ..... 1,278,577,812  
Percentage of the United States ..... 39.2

## Fans at Bruceton

The following is an official statement of the sizes of the fans installed and to be installed at Bruceton mines. The one which was in use at the time of the explosion was a Sirocco, 3 ft. 6 in. in diameter by 21 in. wide and had a nominal capacity of 12,000 cu.ft. against a 1-in. water gage.

The larger Jeffrey fan to be installed is 8 ft. in diameter, and 2 ft. 6 in. wide and has a capacity of 80,000 cu.ft. of air against a 2-in. water gage or 20,000 cu.ft. against a 6-in. water gage.



# Coal Gas Explosion, Vivian, W. Va.

The Bottom Creek Coal and Coke Company's Mine No. 1, at Vivian, W. Va., was the scene of an explosion at 11 a.m., Saturday, Nov. 18, in which eighteen men were killed and three injured. There is no question as to the real cause of the explosion; a body of gas collected in the face of Room 7 in 11th Left and was ignited by an open lamp carried by one of the members of an engineer corps. These men were engaged in surveying the new work in the mine on behalf of the Crozer Land Association, the lessor of the property.

## THE BOTTOM CREEK MINE No. 1

The Bottom Creek mine is situated on the right bank of the Elkhorn creek at a point where Bottom creek enters the larger stream. The Elkhorn has made a narrow valley, not over 600 ft. wide for the most part, with hills about 600 ft. high on either side. The Indian ridge, which is the northern watershed of the

## Editorial Correspondence

*This explosion might have been recorded among the most destructive mine disasters had not the mine been kept damp by humidification of intake.*

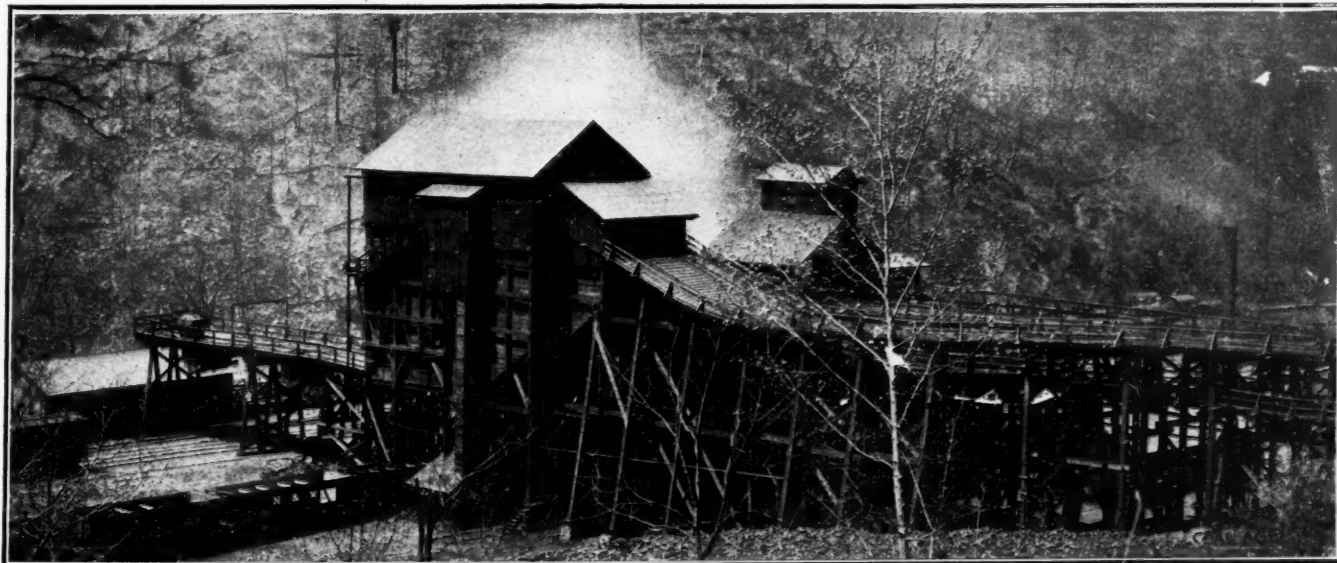
at Vivian has more gas than at points further up the valley. The plant is situated, like all others in McDowell county, on the Norfolk & Western Railway at Vivian, which lies about six miles east of Welch and 28 miles west of Bluefield.

## GAS IN VIRGIN COAL

The main entry is nearly on the strike and consequently the point at which the

## THE WORKINGS OF THE 11TH LEFT

It must be remembered that here, as in many of the newer fields, the principles of conservation are being diligently followed by all the coal operators, though by some more than others. Many mines are in a transition stage from an advancing room-and-pillar system by panels to a retreating system of like kind. The Bottom Creek Coal Company is changing its method, but the headings are not advanced as much as is needed for that purpose. The mine inspectors are urging upon the operators a course of action in heading driving which is not required by the law, but which makes for safety in gaseous mines. This safety provision, which will be described later, is being observed at Bottom Creek. It has delayed heading driving and thus the change from advance working to retreating is proportionately slow. Consequently the new working scheme,



TIPPLE OF BOTTOM CREEK MINE No. 1, VIVIAN, W. VA.

Tug river and of its branch, the Elkhorn, lies nowhere more than four miles distant. The Tug branch lies about as far to the south, so that there is but little water received by the Elkhorn on either bank, and consequently, as a stream, it is of little importance. However, as the Pocahontas bed known as No. 3 crops out conveniently nearly all along the stream from its headwaters in the Blue Stone ridge, the economic importance of the valley is immense and plants follow one another along the narrow waterway in a manner almost continuous. The coal dips toward Welch, the capital of McDowell county, and at that town it is below water level. At Vivian, however, the coal is still 40 ft. above the water level of the Elkhorn. Being about to be submerged below water level, the coal

explosion took place is above the water level of the Elkhorn. But, as stated, probably owing to the submerged condition of the coal to the west, the measure emits firedamp, and firebosses have been employed for over fifteen years. The mine is worked without the use of safety lamps, as are all the mines in this district.

It has been customary also to employ entry bosses at each section of the mine, some bosses having one and some two entries in charge. The duties of the entry boss are to superintend the work and unless some company men happen to be absent, the entry boss is not required or expected to perform any other duties. The entry boss has a safety lamp and he is supposed to aid in watching for the presence of firedamp.

though adopted in principle, is temporarily not being put fully into practice.

An occasional pair of rooms is driven up so as to provide the coal needed to maintain the output. This will account for the irregular appearance of the workings in 11th Left, the rooms numbered from 1 to 9 being driven in irregular sequence, and leaving places for others yet to be started in between them. On Nov. 18, rooms 4 and 5, 8 and 9 were still working and acting in pairs as airways to each other, but the other five rooms were idle, having been extended as far as was necessary. The track was drawn out of them, but they were standing in good condition, the intention being to draw the pillars when rooms inbye from them were finished and their pillars were being drawn back.

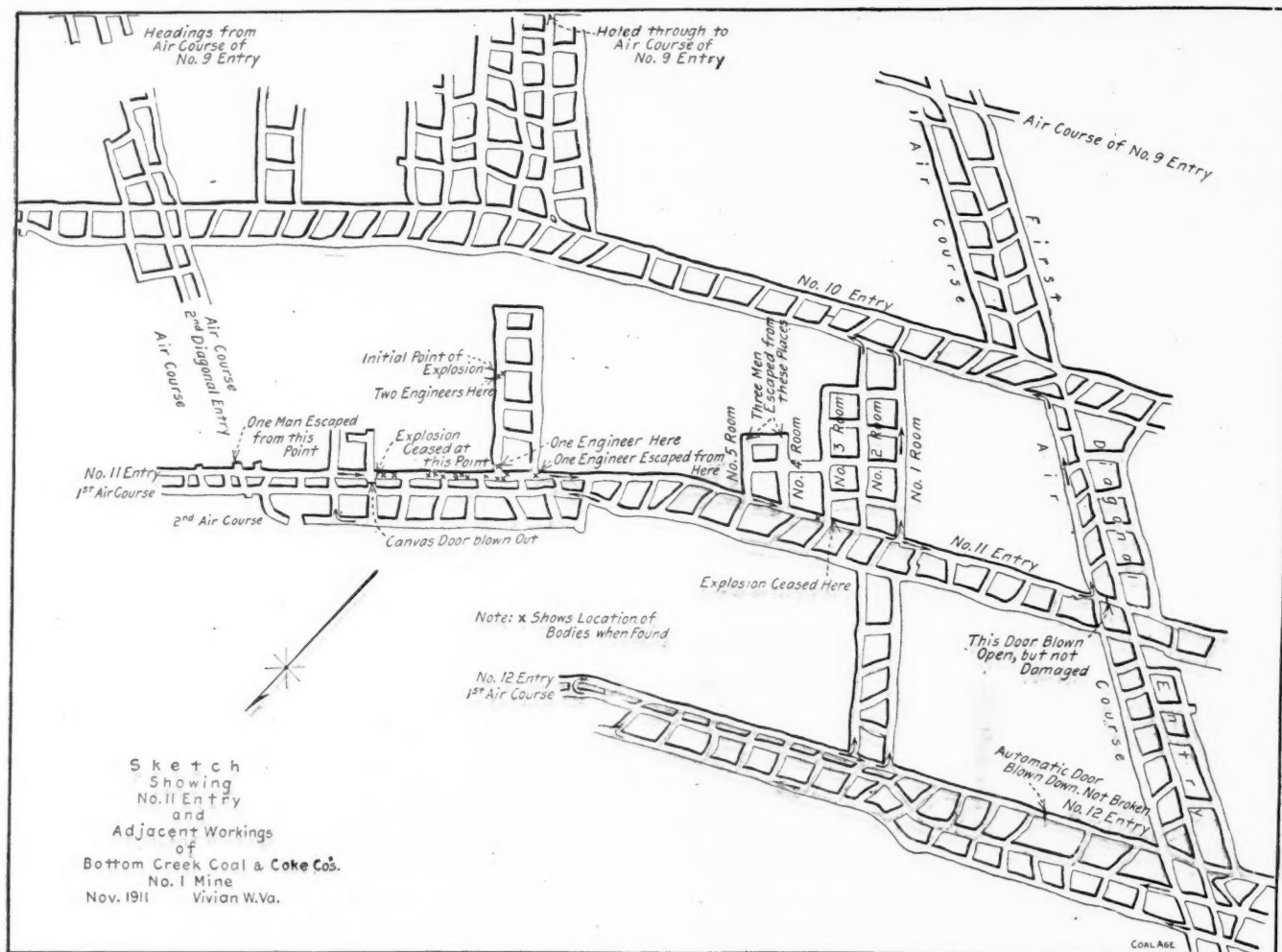
## THE CHAIN PILLARS

Perhaps a digression may be made here to explain the reason for the inequality of the two chain pillars at the end of the heading. The inspectors do not favor the driving of headings, where there is any firedamp present, over 80 ft. beyond the last crosscut. At this distance the West Virginia mining law requires a crosscut to be driven between the headings and the inspectors recommend that no further progress be made in advancing the pioneer work until the crosscut is completed. When the pillar between the

case of the 11th entry, are often driven from the ends of the crosscuts back to meet the face of the advancing airway.

The coal measures 5 ft. 9 in., the immediate roof consisting of from 9 in. to 2 ft. of loose gray slates or shales, which are here extremely friable and which change their condition and fall when exposed to the air. Above this is a black slate, 1 ft. to 2 ft. thick. This slate breaks off in many cases close to the point of support. Above this the roof consists of hard, thick, gray slates on which reliance can be placed.

nor he to them. It is said that they did not see the entry boss in charge of the heading. It has been the custom for the engineer of the Bottom Creek Coal Company to notify the entry boss before entering any abandoned place, and to keep out of that place till it had been examined by him. This was not done in this case, the corps evidently feeling assured that there would be no risk in entering any of the abandoned rooms. Two men went into room 7 to measure it up, and had probably reached a point opposite the third crosscut, 240 ft. from the haul-



PLAN OF THREE ENTRIES IN BOTTOM CREEK MINE, WHERE EXPLOSION OCCURRED

haulway and airway was maintained at a thickness of 40 ft., the driving of this crosscut took so long that the advance of the headings was seriously impeded. For this reason the pillar is cut down to 20 ft. It will be seen how much narrower the right-hand chain pillars are in the recent work than they formerly were. The second airway, as it is termed on the plan, is driven up to reduce the velocity of the air and the consequent friction. This airway is allowed to lag a little behind the other two and the crosscut between it and the first airway is driven ahead of the lagging aircourse. Sections of heading, as can be seen in the

## ENGINEERS OF CROZER LAND ASSOCIATION

The Bottom Creek concern leases its coal from the Crozer Land Association. The mining companies in McDowell county for the most part lease either from the Pocahontas Coal and Coke Company, or from the association just mentioned. Close check is kept to see how much is extracted and what proportion it bears to the whole content of the field mined. On Saturday, the surveying corps of the association, with W. H. Henderson in charge, entered the mine to make surveys preparatory to posting up the maps. They passed the fireboss on the road in but did not speak to him,

way when the firedamp was ignited. This point is 160 ft. from the face of the twin rooms. The men were found lying at that point, when the search was made. Two others of the party were at or about the entry to this room. A helper was at the entry to room 6. He saw the flare coming down that room and fell down on his face or was knocked down. His story varies. The time must have been very short and it is probable that this act was not so much voluntary as the outcome of force. His hands were spread out before him and the passing blaze burned them severely. While unable to walk, he crawled some



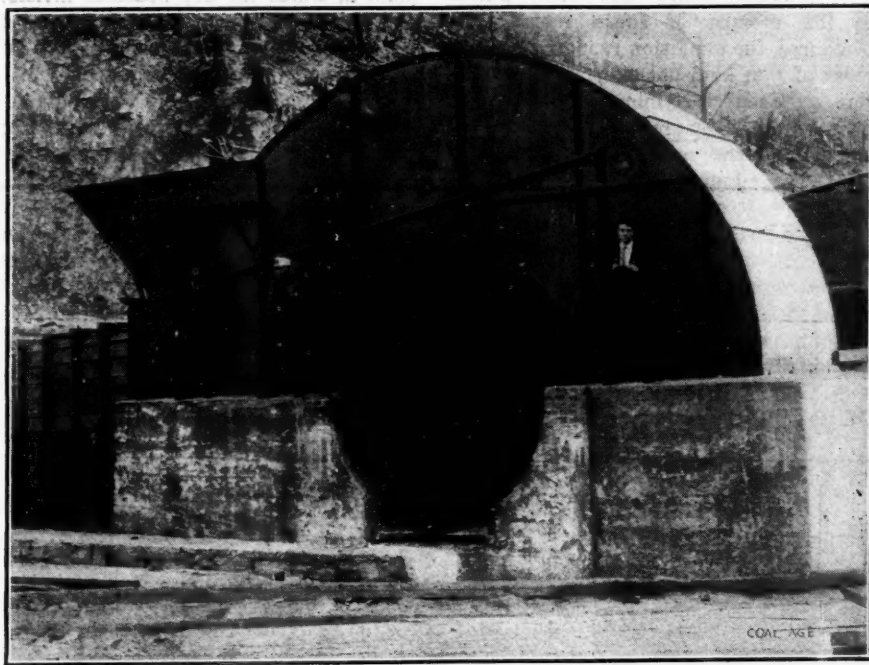
hundred feet to a place lower down, where he was found by a rescue party and removed to the hospital. He is doing well and is expected to show few signs of his terrible experience. That he was not asphyxiated may have been due to a short circuiting of the air current as a result of the explosion. The

perished from after-damp or rock-falls between rooms 7 and 8, which are about 300 ft. apart. Piles of fallen rock were found over and under their recumbent bodies. Some may have been killed by rock-falls, but possibly all died from suffocation or monoxide poisoning and were covered by rock afterward. It is

regretted that the men with one accord ran down the haulway by which the air returned instead of taking the intake airways, one at least of which contained only pure air.

#### A FIREDAMP EXPLOSION

The Pocahontas coal dust has a bad quality of aiding explosions, making it possible for comparatively small accumulations of gas once ignited to cause severe dust explosions. That a severe catastrophe, involving all the 150 persons in the Bottom Creek mine, did not result from the puff of flame which directly killed only five men, was because the mine was kept thoroughly wet by humidifying the air with exhaust steam from the fan engines. This fan, shown in the illustration, is 16 ft. in diameter. At the time of the explosion it was making 120 r.p.m., and the full exhaust passed by an 8-in. line into the workings. To show the effect of this discharge of steam on the exposed surfaces in the mine, it may be stated that canvases erected by the rescue parties are wetted through already by the damp air passing through the mine. Only a few mines in this region humidify the air with steam and the fact that this explosion did not extend beyond narrow limits will tend to make the practice more common. Beside humidification by steam, the coal dust is watered by tanks



16-FT. FAN, WHICH DELIVERS AIR TO BOTTOM CREEK NO. 1

four other members of the party were instantaneously killed by the violence of the expanding gases.

#### THIRTEEN UNNECESSARY FATALITIES

The explosive violence proceeded in both directions from the mouths of rooms 6 and 7, and in traveling toward the first diagonal heading shown in the right-hand side of the plan, it killed one driver and two mules. It passed two drivers, each driving two mules in a team. One mule was killed and one saved in each team. The plan accompanying this article is that furnished the mine inspectors for filing with their report. A note shows where the explosion ceased, but from information from the company it is clear that the concussion traveled somewhat further, but its main evidences were confined between the limits indicated.

In view of the fact that almost everyone would have done what the men did who were back of the explosion in the 11th Left, it seems an unfair judgment to pass to say that through fear or mistaken reasoning they ran to a common and fearful death. But it is unfortunately true, and it is to be hoped that the statement may have some value as a warning. The shock must have been mild where they were working, as their pails were found full of water. The men rushed down the heading, which was a return airway, and all but one



VILLAGE OF VIVIAN, W. VA.

impossible to assert with confidence the actual cause of death, except that they were not killed by the force of the explosion, nor were they burned by the flame. Among them were two company men, four slatemen and seven miners. One man working in the diagonal airway placed his cap over his mouth and got out, passing all the others. It is to be

at this mine and in others, but the main reliance at Bottom Creek is placed in the use of the exhaust from the fan engines. The system has not been very long in force, but it is most favorably viewed by the management. Mr. Samuel W. Patterson, the general manager of the mines and vice-president of the company, says it has not affected the

roof and ascribes the localization of the explosion to the use of steam on the intake.

#### THE MECHANICAL EFFECTS

The explosion blew down some of the stoppings near the center of detonation. They were built of stone, but were not as strong as such stoppings often are, the cementing of one face rather than the thickness of the wall being depended upon to preclude the passage of air between the headings. Strong stoppings increase the violence of explosions by giving them no chance to spread sideways and are not generally favored. However, where dry dust can be found everywhere the extension of an explosion in all directions merely increases its severity. In this case the breaking down of the stoppings probably reduced the violence of the explosion and gave it no additional fuel on which to feed. At the same time it short-circuited the air, assisting all men outby of the explosion

three Russians. The three others were Slavonian, Lithuanian and Italian, respectively.

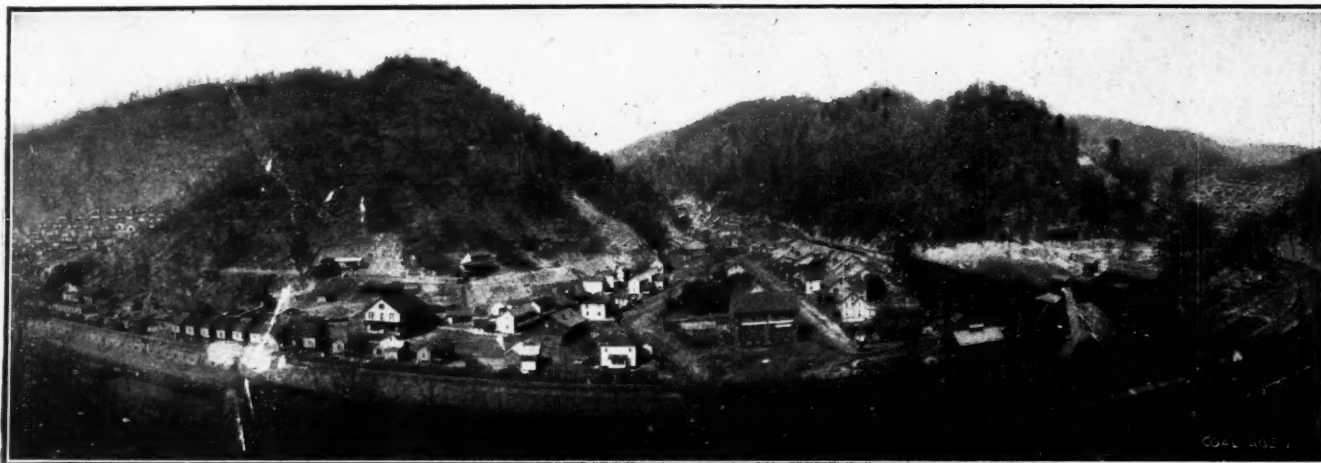
The testimony given before the coroner's jury showed that the rooms in which the explosion took place had been examined within a week and found to be free of gas. It was also stated that a danger board had been placed at the mouths of those rooms, but, of course, the explosion rendered a statement of that kind not subject to verification. When the mine foreman, two days before, measured the air in the last crosscut of the split, he found 15,000 cu. ft. per minute circulating through it. This split, it may be added, carried the air which ventilated the 10th, 11th and 12th entries.

The coroner's jury found that the men came to their death by an explosion of gas in an abandoned room, No. 7, in No. 11 entry of the Bottom Creek Coal and Coke Company's mine at Vivian, McDowell county, W. Va., on Nov. 18,

the cap can again be distinguished. When, however, the outline of the cap is again fully discernible, the flame is slowly and carefully raised. It will be noticed that the size of the cap will increase with the size of the flame, but in the brighter light of the latter, the former will eventually disappear. The point at which the cap becomes invisible determines the percentage of gas, as of course the larger the percentage, the less quickly will the cap disappear.

The fireboss to be able to handle this adequately must, of course, have the opportunity of experimenting in known percentages of gas. In these experiments he will find that with 3 per cent. gas, the cap disappears when the flame has reached a certain height, while for 4 per cent. the flame is somewhat higher, and so on.

This method should not be construed as an accurate determination, nor is it one that may be used in the presence of large quantities or dangerous proportions



BOTTOM CREEK COAL AND COKE COMPANY'S TIPPLE, COKE OVENS AND HOUSES

but leaving the foul air undiluted to the inbye.

The concussion extended to the 12th left and blew an automatic door in that entry out of the perpendicular, thus short-circuiting the air current to the 11th left. Otherwise there was no damage done and the men in other headings had to be notified to leave, as they did not realize that anything had happened. They made their way out without difficulty.

#### THE RESCUE WORK

The rescue was easily effected by the mine officials. The foreman pushed back the door in the 12th left, which was in no way injured, thus reestablishing the air in the 11th left. The rescue party proceeded by the return as far as possible and then completed the work from the intake end. The men in other parts of the mine were meanwhile hunted up and told to leave the mine. Of the men killed four were white Americans, five were colored, three were Hungarians and

1911, at about 11 o'clock a.m., and further, that said gas was ignited by an open lamp carried by some member of an engineering corps then working in room No. 7 of entry No. 11 of said mine.

#### Estimating Gas Percentages

A novel method of determining the approximate gas percentages with the ordinary safety lamp, and without the use of any special appliances, has recently been described by an English engineer. It frequently happens when in the mine and away from special appliances, that it is desirable to know roughly the approximate percentage of gas in a certain place, and the following method is recommended for use in such contingencies.

Having made preliminary examination to insure that gas is not present in dangerous quantities, the flame of the safety lamp is lowered until only a mere speck of white light remains at the tip. The eye, being accustomed to the brighter light, will require a few seconds before

of firedamp with safety. It is believed, however, that there are many occasions at the working face when it will be found applicable.

#### Mining Laws in the State of Washington

##### SPECIAL CORRESPONDENCE

The Senate bill No. 112, Chapter No. 123, Laws of the 1911 session of the State of Washington provided for the appointment of a commission to revise the State coal-mining inspection laws. The revised and recodified laws of this State, as provided by this commission, will be printed in the form of a Legislative Bill to be presented to the members of the Legislature of 1913 on or before Dec. 1, 1912. Two thousand dollars have been appropriated by the Legislature for the purpose of paying the necessary expenses of the commission. Up to the present there has been no examination provided for superintendents, foremen, shotfirers, or firebosses in this State.



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*This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.*

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# COAL AGE

## Humidification

There has been a great deal written about the deleterious effects of humidification. It has been asserted that dampness is harmful to the health, endurance and comfort of the men who are subject to its depressing influence. It has even been hinted that specific germs may have been fostered by it. Moreover, it has been said that constant deterioration takes place in the roof, as a result of its adoption, making dangers from falls of rock greater and costs of mine maintenance excessive.

It were well not to argue the point which may in many cases have a reasonable basis. Rather, it would be better for each operator or superintendent to determine for himself the value of the arguments against humidification. To assume results of any line of action when an experiment would definitely determine the problem, is not so practical as it is popular. In cases where a blowing fan is being used and the exhaust can be readily turned into the intake, the experiment will involve no appreciable cost and is well worthy of a fair trial.

The experience at Vivian, W. Va., forcibly exhibits why the experiment should be made. A forceful gas explosion occurred in a mine having well dampened but highly explosive dust spread through its workings. Yet the explosion died out speedily and, as an explosion, pure and simple, it is probable that it did not pass much beyond the two rooms in which it initiated. Expulsions of burned gas undoubtedly traveled further. The concussion, of course, exhibited itself over a still larger area. But even this was evidenced over a space not exceeding 75 acres. The shock did not create a dust-laden atmosphere of the kind or degree on which the flame might feed and the explosion extend. Here then the principle of humidification was conclusively vindicated.

While some dusts, notably those from the coals of the Allegheny series, are fairly inert, it is not safe to assume that any dry dust is harmless under all circumstances. The Adrian explosion

appears to have originated from, and to have been propagated by, dust. Yet Adrian slope was a Lower Freeport operation, and the dusts of the Freeport coals are considered relatively inactive. It is a new rôle they fill, when they initiate such a disaster as that at Adrian. Consequently, it is not out of reason to urge that even the more inert dusts of bituminous coal cannot be declared off-hand to be safe.

In cases, therefore, where moistening the air of the mine costs nothing, hurts nobody and destroys nothing, is it necessary that the practice be proved essential for safety in operation in any particular case where its adoption is urged? It seems that the burden of proof should fall on other shoulders. Each operator should prove conclusively that humidification is either not needed, or is harmful or excessively costly in operation. The anthracite operators alone may be able to claim immunity on the first count. Where it is costly and abundantly proved unnecessary, then it might be prudent not to urge it; but where it is cheap and harmless, the argument that it is not proved necessary should not have any weight whatever.

It is for these reasons that the extension of the practice is to be looked for in regions where it has been hitherto known only to the student of mining.

## Storing Coal

The storage of large quantities of coal has become an important phase of the anthracite industry. The necessity for such storage was first recognized a number of years ago in connection with supplying the Western markets while navigation was closed on the Great Lakes. As its efficacy to meet the requirements arising from other conditions has been realized and proved, the storage system has been gradually extended throughout the mining region and along the lines of the principal hard-coal railroads, until now all the larger anthracite coal and railroad companies own and operate plants ranging from several hundred thousand to upward of a million tons capacity.

Ordinarily, these plants serve as a sort of industrial flywheel to absorb shocks coming from sharp alterations in the conditions of supply and demand, but their chief reason for being, is found in the labor troubles which periodically threaten the industry and occasionally mature.

From all recent indications, the anthracite operators have been acting on the principle that one way to avert trouble is to be prepared for it, and during the past season have been filling their storage depots to the limit of their capacity. This measure is not threatening or particularly significant; it is the usual and expected action at a time like this when the agreement with the mine workers is about to expire, but in the event of a strike, this accumulated supply of coal is, up to a certain point, the most potent factor in the situation. By it the strength of the operators' position can be pretty accurately gaged.

The system of storing coal against the emergency of a possible strike operates fairly for everyone concerned, and tends to minimize the evil effects of a prolonged disturbance in the industry. The operators, by producing in nine months what they would ordinarily produce in a year, find the effect of three months' idleness to be practically offset, and the increased efficiency of production under full-time conditions, together with advances in price as the available supply diminishes, probably compensate for the additional cost of storage. This stored coal would also have an enormous speculative value during a protracted strike, but it is the policy of the larger companies not to advance their prices and to use the supply chiefly for protecting their markets against inroads from competitive fields.

The miner, no less than the operator, profits by the increased activity of the months preceding the strike and draws his usual annual earnings in the shorter time. If he is prudent and wise, he will accumulate a surplus to tide him over the period of idleness. However this may work out in the case of individuals, the community in general is the better prepared for an industrial depression.

Of course, the necessary result of so much preparation is to compel a period of suspension, strike or no strike, at the expiration of the agreement, in order that the surplus coal may be used and the industry given time to settle back into its normal state.

### Present Day Coal Situation

Some timely and pertinent remarks were made on the present state of the coal trade in this country, by the members attending the last Mining Congress, at Chicago, October 23 to 28, 1911.

When these remarks and suggestions are carefully considered, boiled down and allowed to cool they seem to point the growing urgency of the situation. None of the speakers who took part in the discussion could be said to be so organized that his conclusions and suggestions for remedy would meet with general acceptance. It is a large question entailing, in its final solution, much, as yet, of unwritten law.

One of the most forceful utterances made was that of Walter S. Bogle, Illinois, who said, in the course of his remarks, "The problem or work before us appears to be a campaign of education. . . . It may seem a great undertaking; but the time for it is ripe. The entire business of the country is largely paralyzed by the uncertainty of how that law (Sherman anti-trust law) is going to be applied. The Supreme Court of the United States has said that a *reasonable* combination is right; but the meaning of the word "reasonable" would vary with each individual, and the construction put upon it would be governed by personal interest. . . . Wherever they (the American people) have become educated to understand any great question of the day their decisions have invariably been right."

Referring again to the operation of the Sherman law, the same speaker said, "The object of the law was good. . . . Every self-respecting business man and citizen of this country will stand for a law that will accomplish that (restrain unjust combination in trade)." Mr. Bogle went on to show that, in many industries, the operations of the law had compelled individuals to "a choice between bankruptcy and the violation of the law" and they have not hesitated to choose the latter and risk the consequences.

Self-preservation is, without qualification, the first consideration—the God-given, inalienable right of the individual. No law is complete or successfully operative that compels its own violation or the degradation of the citizen whose purpose it is to safeguard and protect. In the administration and interpretation of all law,

both the government and the judicial courts regard this principle. It is agreed that few laws are so perfect as to require no modification, in administration.

It was stated, in support of this argument, that, notwithstanding it has been declared a violation of law by the Supreme Court of the United States, the Interstate Commerce Commission, with the clearly evident approval of the people of the States, has permitted railroads doing business in several States, to combine to establish and maintain regular and agreed passenger and freight rates.

The same consideration, it was suggested, may be necessary in an equitable solution of the coal-trade problem. The problem is far from being a simple one.

(1) The questions relating to the production of coal concern both the physical and industrial conditions affecting the mining, preparation and loading of the coal. The geological character and formation of coal seams, the rules and customs of labor organizations, in many instances, increase the cost of production. (2) The transportation of the coal from the mine to the market is likewise beset with difficulties relating to obtaining cars, freight rates, switching charges and other items that favor one mine above another. (3) Competing markets often lower the price of coal till only those mines that enjoy the most favorable conditions are able to continue to run. Likewise the railroads and some other large consumers of coal demand and obtain prices, on contract, that are ruinous, and would, in many instances, result in running the mine at a loss were it not for the general trade, which must pay a price sufficiently high to cover the deficit that would otherwise occur.

H. N. Taylor, in remarking upon this condition, stated, "If the railroads would pay just a trifle more it would not then be necessary to force the sale price of a comparatively small portion of coal to an extraordinary figure."

Mr. Taylor drew attention to the important effect produced by the filling of large orders for a certain size of coal. For example, to furnish 1000 tons of, say 3-in. egg or nut coal, it is necessary, under conditions existing in many States, to produce perhaps twice this quantity of coal of sizes for which there is little demand and which must be "dumped on the market" at a price below cost of production for such coal.



# COLLIERY NOTES and COMMENTS

*Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader*

Anthracite, the principal household coal in America, is little used in Great Britain except for malting purposes, barley drying, hop drying, heating green-houses, lime burning, suction and power gas production and on a small scale in steel work.

The habit of using both black powder and dynamite in the same hole is dangerous in the extreme and should be absolutely prohibited. If the dynamite is placed last in the hole, it is apt to blow out the stemming. If placed first, it may blow the slower explosive into the dust raised by the shot.

When working friable coal, the first thought of the miner should be to adopt such a method of mining as will produce the least percentage of small coal. In this respect longwall mining excels all other systems, as the coal is worked in one continuous face, thus necessitating far less cutting, which always increases the small sizes in friable coal.

A continental method for preventing breakage when discharging coal into bins, consists in keeping the bins full of water. The coal is dumped into this water and sinks gradually with little breakage; the water meanwhile overflowing through outlets provided for that purpose. When the bin is full, the water is allowed to drain away and the dried coal is then ready for use.

The practice of tamping a shot with coal dust greatly increases the danger of explosions. Even if wet, the dust is still inflammable; experiments have shown that wet coal-dust stemming gives a flame only slightly shorter than that of dry. Two and five-tenths pounds of black powder and 2.6 lb of dry coal-dust stemming gave a flame 64 ft. long. When the stemming was wet the flame was 50 ft. long.

Tests made at the Pittsburgh laboratory, U. S. Bureau of Mines, show that briquets made without binder, from the inferior lignites of Texas, North Dakota and California, give a hot fire with little shaking or poking and burn readily until consumed, with a loss through the grate of only 6 to 8 per cent. of unburned fuel. When burning they give off a small amount of light yellow smoke.

Electric feed wires should be disconnected from the machines when they are being loaded or unloaded, unless the power is necessary for such operations, and all haulage should be suspended where a feed wire is extended for the

purpose of fitting a machine. Feed wires should at all times be kept clear of the rails and traffic except when connected, and if they are to be carried across track-age, they should be carried under rather than over the tracks.

Most careful attention should be given to the installation of a pumping plant in a newly opened mine. It should not be designed wholly for the immediate needs, but should be so planned that it will be able to handle the increase of water sure to follow further development of the property. Concentration is the keynote of successful pumping. A central pumping plant, with large capacity pumps, should be the aim of all who desire a well planned drainage system.

Some salient points of economical mine management are as follows: All workings should be concentrated as much as possible. Cutting machines should be kept constantly at work, developing new territory. All main partings should be as near the working faces as possible. Long animal haulages should be avoided and the underground roads receive as much attention as surface roads. Care should be taken that little timber is abandoned in old workings and headings.

In order to attain the highest efficiency in steam production, the coal burned should be spread on in thin layers and small quantities, always taking care to keep the fire level by filling up all hollows. Some prefer depositing the fresh fuel on the dead plate in front of the fire bars and gradually pushing the fire back over the bars as fresh fuel is added. Large quantities of coal should never be shoveled onto a fire at long and irregular intervals. From 6 to 9 in. is a good thickness of fire.

The Arthur D. Little laboratory, of Boston, has designed a coal auger for testing the internal heat of coal storage piles. It is capable of being put down 20 ft. in 5 min. Four-foot adjustable extensions allow it to reach any depth desired. A small maximum thermometer inserted near the point gives the temperature, in about 10 minutes' time, much more accurately than it can be obtained by the old method of a thermometer hung in a pipe, cooled more or less by the circulation of air.

Steel cars have these advantages: they are stronger and hold more coal for the same outside dimensions, while for large loads they are lighter than

those of wood and not so easily damaged. When knocked out of shape, however, they are more difficult to get along narrow roads and into cages. As they are constructed of few pieces and without many joints, they do not litter the roads with coal as do wooden cars. They are less suitable for wet mines, because of the effect of acid mine water on metal.

Belgium has 42 factories for the manufacture of square briquets and egg-shaped boulets, which give employment to 610 men. France has 35 briquet-manufacturing plants. England has about 20 plants devoted to briquetting. Spain, China and Japan are also producers of briquets. Compared with other countries the United States is a small producer. At one time 19 plants were in operation, but most of them closed because of inexperience in the methods of manufacture, lack of proper machinery and insufficient knowledge of the use of binders.

At many European plants the coal dust which accumulates in the screening houses is collected for use in the manufacture of facing for iron molders and also of arc-lamp carbons. The dust is collected by means of an exhaust fan, which draws the dusty air through pipes, from underneath hoods built over the shakers or screening tables, into large receptacles where the dust settles and is there loaded into sacks. At a Midland, England, colliery, 2500 lb. of dust per day are removed and sold at a good price. Bituminous- or steam-coal dust is mixed with washed coal for coke making.

In a recent paper before the Institution of Mining Engineers, Mine Inspectors Pickering and Poole remarked that a dread of overwinding accidents is ingrained in miners and managers alike. The reasons are that, when a miner is being raised or lowered, he realizes that he has no control over his own fate. He is dependent upon the skill and attention of others and on the efficiency of the winding appliances. Besides, the fear of falling from a height is a primary instinct of every heavy animal which walks the face of the earth. The manager knows that, in addition to his responsibility for the safety of persons under his charge, he may be held responsible for serious damage which may stop the pit for some time in the event of a shaft accident.

# DISCUSSION by READERS

*Comment, Criticism and Debate upon Previous Articles,  
and Suggestions from the Experience of Practical Men*

## Mine Checking System

### A GOOD SUGGESTION

The fact that miners occasionally lose their way in the mine and wander into abandoned workings and become lost therein, emphasizes the importance of having some efficient and generally recognized system of checking both the number and the name of every person who enters the mine. A check office may be situated near the mouth of the mine or at the shaft or slope bottom, and each person passing into the mine should receive a check bearing the number by which he is registered on the books of the company and by which he may be identified in case of loss or accident. At the close of the day when leaving work, or if the person leaves the mine temporarily to return shortly, he should be required to deposit his check in the check room or office, so that it may be known how many men are in the mine at any time, and who they are.

### THE GENERAL PLAN OF REGISTRY

The arrangement can be made very simple and effective. The labor and expense entailed are not material, compared with the advantage to be derived from the adoption of such a system. First, there is required a mine register that would show the number and name of every man in the employ of the company who would, at any time, have business that would call him into the mine. Such register should also show the name and address of some relative, friend, guardian or other party who should be notified in case of serious accident. All other persons who may, from time to time, enter the mine as visitors, should be provided with a special pass filled out on a blank form printed for the purpose. This pass should be numbered at the check office and the visitor given, in exchange, a brass visitor's check bearing the same number as the pass, which is left at the office while the party is in the mine. The pass, like the mine register, should give the name and address of the visitor and of the party to be notified in case of accident. The pass should, further, over the signature of the visitor, absolve the company from any liability for accident or injury that may be incurred while in or about the mine. This is more necessary with present mine equipment than ever before, because all mine employees are specially warned in regard to the dangers surrounding their work, but visitors to a mine, while receiving the courtesy and attention of a guide,

are not familiar with the dangers to which they expose themselves and should naturally assume all risks incident to their visit. The company, in this case, is *host* and not *servant*, in the eyes of the law.

### A CARD-INDEX MINE REGISTER

Owing to the fact that the list of mine employees is constantly changing, men going away and newcomers taking their places; and, furthermore, because it is desirable that the list of numbers should be continuous and show no voids, but should total the exact number of employees to date, as shown by the highest check number, it is necessary to adopt some system of registering that will admit of change readily.

This could not be effected by any book-roll, but is very simply accomplished by keeping a card index. Each card bears the name, address, age and nationality of the employee, and the name and address of the party he desires should be notified in case of serious accident. Each card, at its time of issue, is numbered, in succession, following the last number of the index, and the party is handed a brass check bearing a stamped number corresponding to the number that is written on his card.

The check is necessary for entering the mine—the same rule applying to every individual employee, from the president down to the door boy. It should be as unchangeable as the old law of the Medes and Persians, which could not be altered. Before entering the mine the check must be deposited in a box and, later, hung on its proper peg, according to its number, where it can be quickly found when the party again comes to the surface.

When a party quits the company he must relinquish his check when drawing his last pay. In order to leave no voids, this check is at once given, in exchange, to the last man on the list; and this man's card is moved up in the index file, and, at the same time, marked with the new number and date of transfer. Not more than one transfer would often occur on a single name, in a long time.

In the absence of a reliable "checking" system, who can say definitely what men are in the mine or out of it? The hysterical, weeping, wailing and screaming of women, who fear that they have been made widows, or have lost fathers, brothers or sweethearts, add to the confusion, which would be greatly reduced by having the exact information that would be afforded by a reliable check board. Aside from this, it is surely "good business" to know,

even under "contract working," who are in the mine each day.

MINE SUPERINTENDENT.

Bolton, England.

## German Selling Syndicate

As bearing on the operation of the German selling syndicate, the following criticism from the standpoint of the British Consulate is enlightening.

In a report covering 1910 and the first four months of 1911, Consul-General Sir Francis Opheimer directs attention to the remarkable increase of coal imported into Germany within recent years, and attributes it to the peculiar methods prevailing in the German coal market. He indicates that the progressive concentration of the German coal production in a few concerns, the difficulties placed in the way of unfettered trade, the almost unavoidable necessity of using the syndicate's selling bureau, which practically ignores personal preferences for certain brands, and a price policy which prevents judicious purchases at favorable opportunities, have led the more important consumers to take means to free themselves from the dictatorship of the syndicate by the purchase of British coal, which enjoys the advantages of cheap transit by water.

Sir Francis says the price policy of the syndicate is the greatest help in the sale of British coal, and as long as it lasts the hold of British coal on the German market is not likely to be weakened by any lowering in freight charges by the railways in Germany. He adds that the question of an import duty on coal may safely be left to the German consumers, who are fully alive to the fact that, if they were deprived of the opportunity to obtain British coal, they would be at the mercy of the syndicate.

London, England.

R. L. B.

## Letter from a Working Fireboss

In regard to the examination of the mine by the fireboss, the Pennsylvania bituminous-mine law requires that the fireboss, three hours prior to the appointed time for each shift, shall examine, for all dangers, all portions of the mine in his charge; and at each examination shall mark the date, at the face and on the side of each place examined. He must, therefore, examine all haulageways and the entrances to all worked-out or abandoned places.



The law requires each miner to examine his place himself, before going to work, to see if the date has been left by the fireboss. If he does not find it he will know that the fireboss has not examined his place. He must then, at once, notify the mine foreman or his assistant before proceeding to do any work in the place.

Now suppose the fireboss should not examine a working place, through neglect or other cause, and the miner should enter the place and go to the head of the room in order to see if the date, which the fireboss should leave there, is marked on the face of the coal. It might be the last of the miner. To avoid this I think there should be a small blackboard placed at the entrance to each working place, and the fireboss should put the date on this board as well as on the face and side of the coal. The miner could then see if the fireboss had done his duty, by examining the board at the entrance to his place, before proceeding to the working face. If the proper date has not been put on the board by the fireboss, the miner should place his check number on the board and see that his working partner does the same; these check numbers to remain on the board till the fireboss makes his round the next morning or till he next examines the place. After the examination of the place the fireboss should erase all on the board and place there the date of the examination.

This system, if adopted, would allow the mine foreman or any other person to see and to know what men were at work. In case of an explosion the boards would show what men had entered the mine and were at work that day, in each working place.

A PENNSYLVANIA FIREBOSS.

### British Solution of Minimum Wage Problem

It will be recalled that one of the demands formulated at the recent convention of the United Mine Workers of America at Pottsville, Penn., was a minimum daily wage for miners. This point has been vigorously contended for at other times and in other fields—notably by the miners of Great Britain.

The following letter from a correspondent in Wigan, England, contains timely reference to this subject which will doubtless, before long, be agitated generally:

At Seaton Delaval, Northumberland, a scheme has been instituted under which the earnings of pick miners are pooled and equally divided. This experiment has a bearing on the agitation for a minimum wage. In this district some of the places are of unusual hardness, and other difficulties prevail with the result that some miners cannot earn a dollar a day, while

others more favorably circumstanced are earning from three to four dollars.

Under the pooling arrangement referred to, it is claimed that one of the greatest hindrances to harmonious working will be removed, in so far as each man will receive the average wage of the mine. The further argument is advanced that under prevailing conditions this scheme which is now being tried will at once give the "minimum" the miners in Northumberland have applied for, namely 30 per cent. advance on the 1879 basis, always providing that the general body of the men work as hard under the scheme as they have done under the old system.

Of course, pooling has its disadvantages, the chief one being that while part of the men receive a substantial advance, the rest voluntarily suffer a proportionate reduction. Nevertheless, if the colliery companies cannot be prevailed upon to make some award or bonus to balance the "abnormal places" drawback, it really would appear that in the widespread adoption of pooling, the colliery communities of Great Britain will find the readiest and simplest solution of a vexing problem.

Wigan, Eng.

B. A. W.

### Essentials for Successful Management

It would be a mistake to assume that the office of mine manager is a sinecure. It is a life of perils escaped and victories won, with more or less contention with disasters and labor upheavals in the form of strikes. A mind almost encyclopedic in character is essential to secure the necessary acquaintance with all the sciences that may be applied by the mine manager; the foibles and idiosyncrasies of man himself have to be observed with the utmost tact; trivial causes that may be productive of much friction with the miners' union have to be avoided with the skill of a general; troubles and peculiarities of the strata have to be studied and overcome; while the contending forces of labor and capital have to be mollified—the one ever seeking higher pay for the work accomplished, and the other constant in demand for increasing dividends on capital sunk.

On the social side, of course, the manager is pretty much what he makes himself. As Henry Davies aptly puts it, he may be "the most abused man in the colliery village, because he assumes the rôle of petty tyrant, or one who by fair judgment, urbanity, and conscientious discharge of a difficult task, wins the respect of his workmen and the confidence of his neighbors. His power for good in molding the character of the men in his charge is incalculable. By means of the music hall, concert room, gymnasium, society building or lecture hall, he

has channels through which he may support all progressive movements calculated to benefit the workmen, and inculcate habits of thrift and temperance." The latter is more necessary for the safety of the entire pit force than is sometimes realized.

Thus it is seen that while the position and life of the mine manager have their serious responsibilities, they also carry compensations and advantages that the humanity in man ever craves for. In coal mining the greater liberty and play this humanity is allowed, the easier the task, and the lighter the responsibility. In illustration of this and the pleasures to be derived, the story may be recounted of how William Bumpstead managed the Treeton House Colliery in Yorkshire, during the period when he raised the daily coal output from some 270 to 3000 tons. As to the condition of the mine under Mr. Bumpstead, after his last inspection H. M. Inspector of Mines said, "The Pit is in excellent condition, and one of the best in South Yorkshire."

How was all this accomplished? The reasons may be stated briefly:

(1) Mr. Bumpstead believes it is the duty of the man in authority to get to know his men, and make firm friends of them.

(2) He believes in giving a man a dollar for a dollar's worth of work, and urges all not to try to get a dollar's worth for 75 cents. He has never been asked or expected to pick workmen's pockets.

(3) He has been tolerant, and thereby invited tolerance, the best medicine when trouble is about.

(4) He has never been in too big a hurry to improve upon the management of his predecessors, having made it his duty first to find out the peculiarities of the pit.

(5) At no time has he imposed hardships on those under him for personal aggrandizement.

(6) Finding himself surrounded by a capable set of officials—civil, energetic, painstaking men—he made them feel that they were managers in their own particular districts.

(7) He encouraged coöperation with his under officials, and if at any time something went wrong a "confab" was sufficient to get matters right. From experience he finds that is the way to work. A comfortable set of men means better work, greater output and peace. Thus at Treeton they improved the outlook for the company, and in so doing the men shared in the benefits.

The foregoing may seem small things, almost too trivial to command a second thought, but they represented success in capital letters at Treeton. If your own colliery isn't the success you would like it to be, just run over the points again and ask yourself a question or two. It may pay you in the end.

Manchester, England.

R. O. E.

# INQUIRIES of GENERAL INTEREST

*A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer*

## Furnace Ventilation

Expecting to open a shaft mine for the development of a 5-ft. seam of good coal, it is desired to ascertain: (a) What ventilating pressure may be expected in the use of a furnace in this mine? The seam is practically level and the depth of the furnace shaft will be about 150 yd., including the stack. (b) What volume of air will this pressure produce when the mine is ventilated in two equal, separate splits starting from the bottom of the shaft? The size of all airways and entries is 6x10 ft., and the total length of airways, including return, may be estimated as 12,000 ft.

Pittsburg, Penn. A. C. M.

(a) Knowing the depth of the furnace shaft, the ventilating pressure that is possible to be developed in the mine, under usual conditions, may be calculated by the formula

$$p = 0.11 \sqrt[5]{D^4}$$

which gives, in this case

$$p = 0.11 \sqrt[5]{450^4} = 14.6 \text{ lb. per sq.ft.}$$

(b) The entire rubbing surface in the mine is  $2(6+10) \times 12,000 = 384,000$  sq.ft. The quantity of air circulated by the pressure just found, assuming two equal splits of the air-current, which makes the sectional area  $2(6 \times 10) = 120$  sq.ft., is

$$q = 120 \sqrt{\frac{14.6 \times 120}{0.00000002 \times 384,000}} = 57,300 \text{ cu.ft. per min.}$$

## Sulphur in Coal

We have, in our mine, a considerable quantity of sulphur that occurs in round chunks and is separate and apart from the coal. This could be handled easily if it has any commercial value. Will you kindly inform me in regard to this? Can send a sample if necessary.

SUBSCRIBER.

Prestonsburg, Ky.

This deposit is the well known "sulphur balls," or iron pyrites, that occurs frequently in coal seams and the contiguous strata. Owing to the bright-yellow color, resembling gold, it has often deceived the miner, and has been styled "fool's gold."

Pyrites has a commercial value only where there is a demand for its use in the production of sulphuric acid or other sulphur products, and the cost of mining and transportation is not prohibitive. In general, it may be stated that the supply exceeds the demand, which fact makes

only the best and clearest grades of pyrites marketable. The market value of pyrites carrying from 44 to 48 per cent. sulphur is about 9c. per unit, which means 9c. for each per cent. of sulphur in the ore as shipped, per ton. The value of the deposit must always depend on cost of transportation to the market, freedom from arsenic, and what disposition can be made of the associated or by-products. In some localities, the existence of copper smelters, working on sulphide and producing sulphuric acid as a by-product would destroy any possible market for the iron pyrites.

## To Find Length of Sub-chord

Is there not a shorter method than that of proportion for ascertaining the proper deflection to be used in laying off sub-chords on a curve?

MINE SURVEYOR.

Yes. Multiply three-tenths of the sub-chord in feet, by the rate of curvature expressed in degrees and decimals of a degree; the product will be the proper deflection expressed in minutes. For example, the proper deflection for a chord of 15 ft. 9 in., on a 16 deg. 22 min. curve, is found thus: 15 ft. 9 in. = 15.75 ft., and 16 deg. 22 min. = 16.367 deg.; then,  $0.3 \times 15.75 \times 16.367 = 77.33$  min. = 1 deg. 17 min. 20 sec. is the deflection for this chord, on the given curve.

## Closing Force on Mine Door

A mine door measures 6x6 ft., and is made of inch oak boards doubled, and is hung with the upper and lower hinges 40 in. apart, the lower hinge being 5 in. out of plumb so that the door leans when closed, in the direction the air-current is moving; if the ventilating current be reversed, what water-gage will open the door?

FIREBOSS.

Area of door 6x6 ft. = 36 sq.ft.; thickness 2 in. =  $1/6$  of a foot; volume of door = 6 cu.ft.; weight of door with oak weighing 50 lb. per cu.ft. =  $6 \times 50 = 300$  lb. Now when the door is closed, it lies wholly in a plane inclined 5 in. in 40 in. or 1 in 8, to the vertical. A line at right angles to that plane is inclined, therefore, at 1 in 8, to the horizontal. This is the direction in which every point moves, for an instant of time, on opening the door, that is, at right angles to the plane in which the door lies or inclined at 1 in 8, to a horizontal plane.

The center of gravity of the door, which is the same point as the center of pressure of the air on the door, moves in that direction. As, therefore, the center of gravity moves momentarily up a grade of 1 in 8, the power required to move it, for that instant of time, is one-eighth of the weight of the door or  $1/8$  of 300 lb. = 37.5 lb. The area of the door being 36 sq.ft., the pressure per square foot must be  $\frac{37.5}{36}$ , or 1.0416 lb. per square foot.

The water gage required to open the door, after reversing the current, is, therefore,  $1.0416 \div 5.2 = 0.2$  inch.

## Estimating Quantity of Air

Is there any way by which we can ascertain the quantity of air flowing through an airway without using an anemometer to find the velocity of the air-current?

FOREMAN.

Yes. (1) The velocity can be found by observing the time, by the watch, that the smoke of a flash of powder takes to travel a certain measured distance, in a uniform section of the airway; then, multiply this velocity (feet per minute) by the area of this airway (square feet), and the product will be the required quantity of air (cubic feet per minute). Or, knowing how much air will circulate in this airway, under a certain water gage, the quantity of air for any other observed water-gage reading, in the same airway, can be found.

For example, if the water gage in this airway, yesterday, read 1.6 in., and you had measured the air then and found it to be 84,000 cu.ft., and today the water gage reads 2.2 in., assuming this increase of water gage is wholly due to an increase in the circulation, the quantity of air passing may be calculated by applying the principle that, for the same airway, the ventilating pressure and therefore the water-gage reading are proportional to the square of the quantity of air produced. Or, what is the same, the quantity of air produced is proportional to the square root of the water gage. Therefore, the quantity ratio is equal to the square root of the water-gage ratio. Now, calling the desired quantity of air  $x$ ,

$$\frac{x}{84,000} = \sqrt{\frac{2.2}{1.6}} = \sqrt{1.375} = 1.1726$$

$$x = 84,000 \times 1.1726 = \text{say } 98,500 \text{ cu.ft. per min.}$$



# EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

## Interesting Questions

### STRENGTH OF CROSSBARS OR COLLARS

**Ques.**—(a) Explain as simply as possible the correct method of calculating the strength of a round or square crossbar or beam when the load on the beam is equally distributed along its length. (b) How does a center load compare with a load that is equally distributed, in its effect to break a beam or crossbar?

**Ans.**—Any beam or crossbar is considered as made up of a bundle of parallel fibers, each having a certain strength to resist a force of extension or compression—a pull or a push. In the case of a horizontal beam (Fig. 1) carrying a load, the weight of the load acts at right angles to or across the fibers. As the beam bends slightly the fibers in the lower portion are extended and those in the upper portion compressed. The strength of the fibers to resist this extension and com-

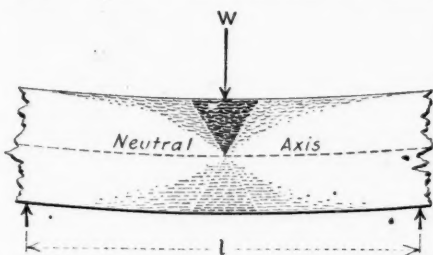


FIG. 1. BEAM OR CROSSBAR, SHOWING GRAPHICALLY EFFECT OF BENDING

pression determines the strength of the beam.

The force exerted to stretch or compress the fibers, per unit of section, is called the *fiber stress* and is estimated in pounds per square inch. The safe fiber stress is the safe load or stress, in pounds per square inch of section. For example, the safe fiber stress of different kinds of well-seasoned timber used in mining may be taken as follows, using a factor of safety of 6 for transverse loading:

Ash.....	1650	lb. per sq. in.
Yellow pine.....	1250	
Hickory.....	1100	
Oak, red cedar.....	1000	
Black walnut.....	800	
White pine, hemlock, spruce.....	750	
Poplar, birch.....	700	

(a) The center load  $w$  (Fig. 1) is supported one-half at each end of the beam. The reaction at each point of support ( $\frac{w}{2}$ ) acts with a lever arm of one-half the distance between supports ( $\frac{l}{2}$ ), giving a bending moment at center of beam ( $\frac{wl}{4}$ ) inch-pounds. This bending moment is re-

sisted by and equal to the combined forces resisting extension and compression in the fibers, with respect to the neutral axis, which, for a beam of uniform section, is at the center of the beam. The combined effect of these resisting forces is found by multiplying the unit or fiber stress of the material by what is called the section modulus of the beam.

The section modulus is the moment of inertia of the beam's section divided by the distance from the neutral axis to the extreme fiber. For a round, square or rectangular beam the value of the section modulus is as given below, in Fig. 2.

To illustrate, the combined resistance of the fibers to extension and compression, in a round oak collar or crossbar 8 inches in diameter, which has a safe fiber stress of 1000 lb. per sq. in., and whose section modulus is  $\frac{8^3}{10.186} = 50.265$ , is  $1000 \times 50.265 = 50,265$  in.-lb. To find what center load this crossbar would

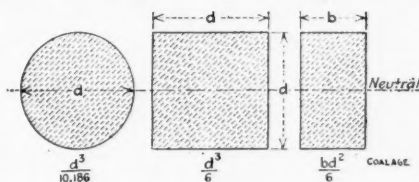


FIG. 2. SHOWING VALUE OF SECTION MODULUS FOR CIRCULAR, SQUARE, OR RECTANGULAR BEAM

carry safely, for a clear span of 10 ft. (120 in.), call this safe center load  $x$ ; then,

$$\frac{x \times 120}{4} = 50,265$$

$$x = 1675 \frac{1}{2} \text{ lb.}$$

(b) An equally distributed load is always double the center load producing the same bending moment.

In the use of this formula, it is both interesting and important to note that a crossbar will generally fail by shearing instead of bending, whenever the diameter of the beam is greater than 1/15 of the clear span, for a round beam (circular cross-section), and a uniformly distributed load; or 2/15 of the span, for the same section of beam, loaded at the center. For a rectangular cross-section, the beam will fail by shearing instead of bending, when the depth of the beam exceeds 1/20 of the clear span, for a uniformly distributed load; or 1/10 of the span, for a center load. In any of these cases, the safe load the beam will carry must be calculated by the formula for finding the shearing load; thus,

Round beams,

$$L = f_s (0.7854 d^2).$$

Rectangular beams,

$$L = f_s (b d).$$

The safe unit shearing stress ( $f_s$ ), or the shearing stress per square inch of section, for timber, may be taken as 1/15 of the values previously given for extension and compression of the fibers.

The practical application of the above is shown in the knowledge of the fact that an 8-in. round collar, uniformly loaded, will fail by shearing at the legs of the framing, on any span less than  $\frac{8 \times 15}{12} = 10$  ft. The same collar will yield by bending on any span exceeding 10 ft. A 6x10-inch square beam uniformly loaded will likewise fail by shear-

ing, on any span less than  $\frac{10 \times 20}{12} = 16 \frac{2}{3}$  ft., or 16 ft. 8 in.; and the same beam will bend before it will shear on spans exceeding this amount. The same rectangular beam, 6x10 inches, if loaded at the center, would shear before bending on spans less than  $\frac{10 \times 10}{12} = 8$  ft. 4 in., and bend before shearing on spans exceeding this amount.

### VENTILATION—CIRCULATION IN TWO AIRWAYS COMPARED

**Ques.**—Suppose two entries of the same length are ventilated by equal pressures, under like conditions; one entry is 8 ft. wide and 5 ft. high; the other is 10 ft. wide and 4 ft. high. Inasmuch as these entries have the same sectional area and equal lengths, why will they not pass equal quantities of air, for the same pressure?

**Ans.**—For any given ventilating pressure, the quantity of air in circulation in an airway is given by the formula

$$q = \sqrt{\frac{p a^3}{k l o}}$$

Assuming that the pressures ( $p$ ), areas ( $a$ ), lengths ( $l$ ) and the coefficient ( $k$ ) are each constant, it is clear that the quantity of air ( $q$ ) varies inversely as the square root of the perimeter ( $o$ ). In other words, the quantity ratio is equal to the square root of the inverse perimeter ratio; or, since the perimeters of these two airways are  $2(5+8) = 26$  ft., and  $2(4+10) = 28$  ft., respectively,

$$\frac{q_2}{q_1} = \sqrt{\frac{o_1}{o_2}} = \sqrt{\frac{26}{28}} = \sqrt{0.92857} = 0.963.$$

That is to say for every 1000 cu.ft. of air that passes in the first airway there is 963 cu.ft. passing in the second airway.

# SOCIOLOGICAL DEPARTMENT

*A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department*

## Liquor Problem in Mining Communities

The Welfare Plan adopted by the Donahoe Coke Company, and discussed in my article last week, included more than the control of the liquor traffic—it comprehended the *secret* of that control which was, with the coöperation of the company, to place opportunity for better living conditions right in the hands of the employees.

Part of the main street and some of the yards were graded but not sodded. A few of the houses were wired for electric lights.

Families using the least liquor were given the best houses. Those whose beer

yards, lumber with which to construct sidewalks, fruit trees, flower seeds and things necessary in preparing and making gardens.

### THE WIFE AND THE BEER RECORD

It was not long before "Mary" noticed the great change taking place in her neighbor's yard and house. "Mary" asked her neighbor how this change was made possible. She was told that if the family reduced the weekly beer record she could have a house on the graded street and secure the material with which to fix the yard and make a garden. "Mary" then talks with "John" and the boarders, and down goes the beer record.

Oh, yes, it hits a little hard at first,

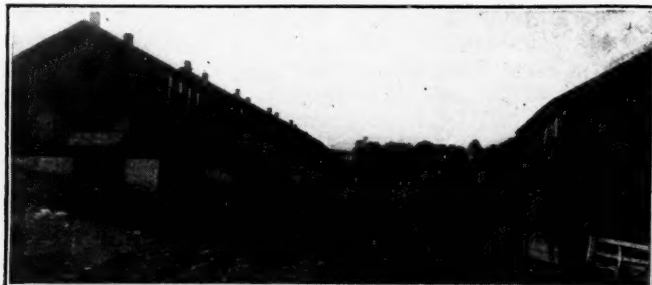
more money save, nice house and feel good." "But how about the superintendent, does he always keep his promises," I asked. "Oh, yes, Mr. Super alright. What he say he do it, he do. Boss alright."

What is the secret? A welfare plan that restricts the use of liquor, but makes the securing of all benefits that better the living conditions depend upon the initiative of the family—we say "family" as "Mary" is the "reformer in the house."

To give some of the beneficent results of the work of the Greenwald Committee: By September, 1911, so many families had graduated into the better-class houses that the company removed all but two of the shacks.



HOUSES FENCED AND STREETS GRADED



THE LAST OF THE OLD-TIME SHACKS



A BACK YARD AS IT USED TO BE



ONE OF THE BACK YARDS TODAY

record were not down to the minimum were given second-class houses, and the families that ordered the full amount of liquor allowed were given the "shacks."

The full allowance (except under special conditions) was five kegs per week to a family (including the boarders) if living in a "shack," three kegs if living in a second-class house and two kegs if living in a first-class house.

The rent was the same for all houses.

Families with a low beer record could secure from the company, sod for their

but "Mary" must keep up with her neighbor. How many men in our cities have purchased pianos and automobiles just because their "Mary" would "break her heart if she could not keep up with her neighbor, Mrs. Goldbanks." Yes, it goes a little hard with "John," but he also gets the "desire" as time goes on. As one miner (a Slav) at Crabtree said to me: "Yes, like to live in best house (and he pointed with pride to his house and garden), but three kegs of beer a week not much for five boarders, but, well,

### COMPANY ENCOURAGED TO EXTEND WELFARE WORK

To keep pace with the social and moral advancement of the people of the community the Donahoe Coke Company has graded another part of the main street, put electric lights in 16 houses, a bath tub in one house, painted several of the first-class houses over, not with the regulation prison-house garb, company-house-red, but different houses with different colors, with five distinct colors to be exact. The yards have been



fenced and coal houses and garbage chutes built at the rear of each lot. A sanitary officer is employed and he has the teamster collect the garbage daily.

The company has arranged with a farmer to supply all families with good fresh milk daily at *five cents a quart*.

The Welfare Fund supplies each family with free ice. One hundred pounds is delivered to each house every Wednesday and Saturday and Mr. King states, "We are building a chicken house for each family and are preparing to establish a large fruit-, shrub- and shade-tree nursery from which we will supply each family with trees for the yard as fast as a definite desire to have and care for the trees is exhibited."

The company is also planning a complete sewerage system and a plot will be surveyed upon which will be built several blocks of single houses.

Play grounds for the children will be added later, when the community life has reached the point that the initiative of the people themselves will create the natural demand.

#### APPLICABLE TO LARGE AND SMALL COMMUNITIES

Some operators may say, "The plan may work at a small operation but it would fail in the larger mining towns."

the men and their families and since it has been in operation *our tonnage has not been reduced one ton of coal through the use of liquor by employees.*"

Of course the superintendent of a mine could not successfully promote a plan so comprehensive as that of the Greenwald Welfare Committee without the full sympathy and coöperation of the company. It goes without saying that Mr. King has had that coöperation. In fact, John P. Donahoe has personally interested himself in every detail of the work and a statement of his views should be instructive and of interest to all mining men who are giving attention to the liquor problem and the welfare of the mine employees.

#### THE COMPANY APPROVES WELFARE WORK

In a conversation recently Mr. Donahoe stated among other things that "To carry on a work such as that of the Greenwald Welfare Committee the men must first of all have implicit confidence in the word of the superintendent." "Do not keep the 'company' constantly before the eyes of the men. We use the name Greenwald Welfare Committee to avoid an undue reference to the Donahoe Coke Company."

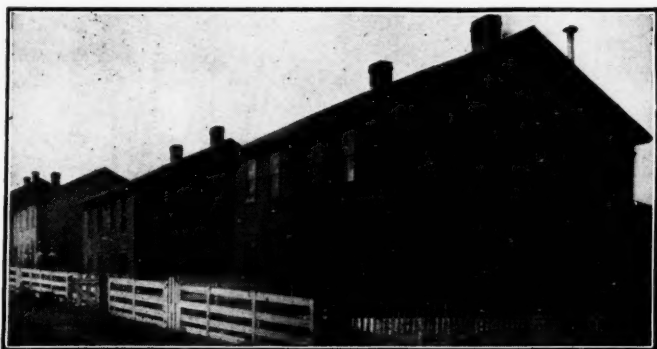
"The plan to be successful must be one where initiative is required on the part

or pull at anything adhering to the wound. Cut away clothing with scissors.

With extensive burns, uncover and dress a small portion of the burnt surface at a time, in order to reduce the pain of the operation as much as possible. Never pull the clothing off a burn; always cut it away. Cover all exposed burnt surface immediately.

All first-aid supplies should be kept in a tightly closed receptacle in order to keep them free from dust. Never handle unless absolutely necessary. Packages of dressing should never be opened or the paper cover in any way broken until they are about to be used, as it takes only a slight touch to render them septic. Remember that water, though it seems pure, is not sterilized, unless rendered so by special treatment, and wounds washed with unsterilized water, or bandaged with bandages which have been handled, are apt to give trouble. Septic bandaging is worse than none at all.

In case of a fractured spine, which is of comparative frequency in mines, the first-aid man can render little assistance, except to insist that the patient be kept flat upon his back, as placing him upon his side or face for any length of time may kill him. If the spinal cord is not torn, one of the best things for the



FIRST-GRADE HOUSES, EACH PAINTED A DIFFERENT COLOR



TWO SIDE YARDS, SHOWING FLOWERS AND SHRUBS

Mr. King says, "Our handicap is due to the small size of our plant and lack of sufficient houses. If we were employing a large number of miners we could work out our plans much better. The solution of many problems is to secure an atmosphere of home contentment and each workman and his family should be furnished with a home of such a type as will secure privacy and then they should have an opportunity to fix it up and feel that they are, at least, human."

"We have experimented enough to learn that the foreigner, like ourselves, desires something to call his own, some way by which he may express himself and feed and develop his own individuality. Permit him to construct his own walks, plant his own trees and flowers and he is much more contented than he would be if you were to do it for him."

"This plan works to the betterment of

of the men and their wives." "Our best temperance reformer is the woman in the home." "You would suppose our bosses live in those newly painted houses. Well, a Slav teamster lives in the first house and a miner lives next door."

#### First Aid Hints

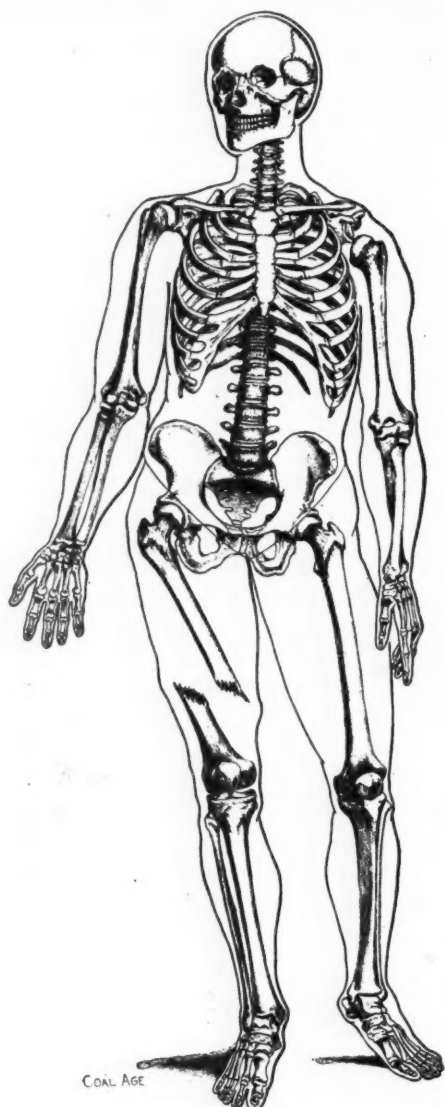
An improvised stretcher can be made of a couple of jackets, with sleeves reversed. The coats are laid tail to tail. Poles are passed through the reversed sleeves and the coats buttoned up.

A burn should not be exposed to the air a minute longer than is necessary. Interfere as little as you can with the surface of the burn before dressing. If you distinctly see foreign bodies on the surface, remove them before applying the dressing. But under no pretext drag

first-aid men to do is to make a cradle splint. This consists of four boards, two long and two short, 1 in. thick and 3 in. wide. The shorter splints should be about 18 in. long and the long splints from 4½ to 5 ft. long. Place the splints 3 in. apart, then nail or bandage them together as circumstances permit. Pad with anything which can be procured most quickly. With one motion turn the patient on his side, rest the splint on his back, lay him back again flat upon the ground, and bandage securely the shoulders, hip joints, knees and ankles. All work on patients suffering from spinal injuries should be most carefully done as additional jar to this great nerve center may mean immediate agony and death in the near future. A set or sets of the splints above described kept near the working faces would do much to relieve the pain of many an injured miner.

## Physiology and First Aid

The illustrations below are the same as are exhibited in the Red Cross cars and published in the "First Aid Manual" of Lynch and Shields. The central figure shows the bony structure of the body with the names of the various parts. It

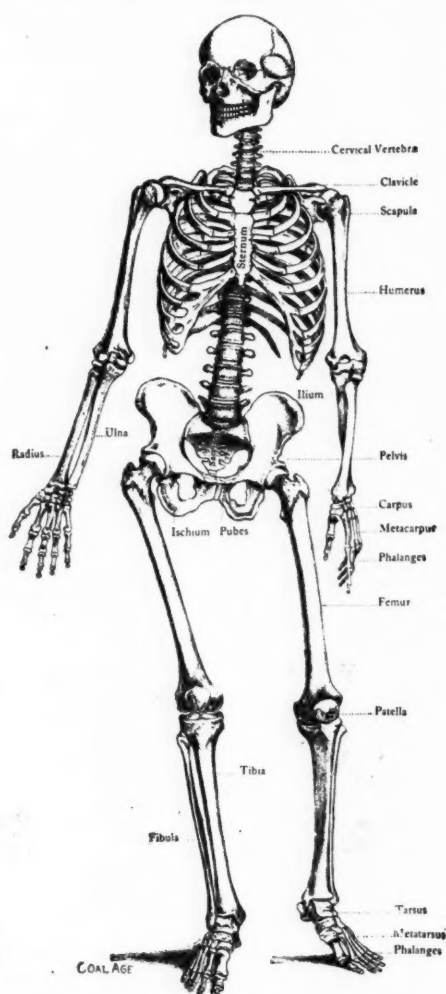


SHOWING DISLOCATION AND FRACTURE

is necessary for the first-aid man to know where the bones lie, but this is not that he may put them back into place. That is not his work. But it does give him an idea how he can keep in line the bones which have been fractured and not displaced. It is an unfortunate fact that the "subjects" on which first-aid men must practise, are men with limbs and trunk in perfect line. Fractures occurring from the misfortunes of industry, are frequently badly compounded. The physical training of first-aid men does not cover such fractures, and training by word of mouth does not persist in the memory like information entering the brain by the eye.

The following words from the manual mentioned, should be impressed on those who will act as aids to the absent phy-

sician. "If a sharp bone is buttonholed through the skin, as frequently happens, do not attempt to restore it to its place, but by padding the splint hold the bone in position *just as it is*." Clearly should it be retained in mind that the fractures we shall dress in the mine are not the same as the imaginary fractures seen on the Forbes field and any fracture which does not leave the bone in place is particularly hard to correct. The returning of the section thus displaced by a lay



SHOWING BONY STRUCTURE OF BODY

worker will frequently lead to a severed artery and torn ligaments.

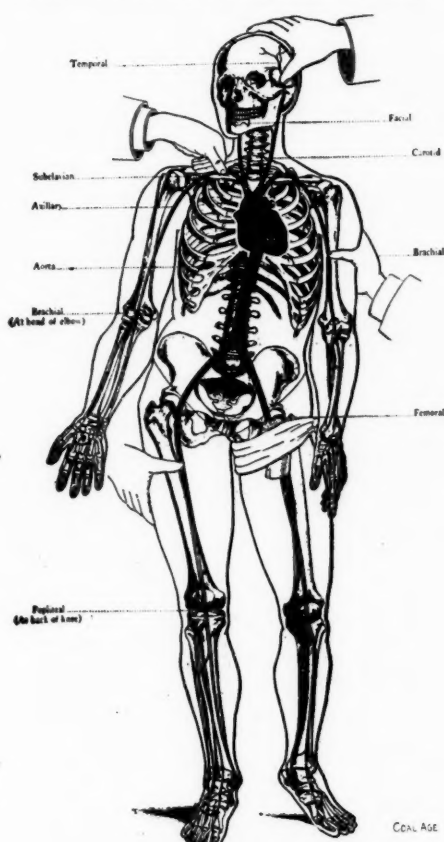
### A KNOWLEDGE OF THE LOCATION OF ALL ARTERIES IS MOST ESSENTIAL

The right-hand illustration shows arteries and bones in a single figure. At once is clear the value of a knowledge of the bony structure, because arteries cannot well be pinched and their blood flow controlled where there is no bone nearby to form the hard wall against which the pulsing artery can be deformed to such a degree that it cannot pass blood.

Very clearly with all reference to venous-blood passages omitted, the arteries are outlined, backed by the bones which protect them and against which

they can be compressed and deformed. The hands of first-aid men are shown compressing these arteries at the appropriate places and this makes it easy to understand where the blood-flow can be controlled to the skull, the upper half of the arm, the forearm and the leg. In the latter case a compress is shown deforming the femoral artery against the femur of the left leg.

The other illustration here reproduced shows the dislocation of the left arm, the whole member being drawn down so that the upper joint of the scapula no longer turns in the socket of the clavicle. The upper right-leg bone or right femur is fractured and as the parts are separated the fracture is compound. It might



VIEW OF ARTERIES AND BONES

be suggested, however, that the sketch of this fracture is not true to life and does not suggest the difficulties of treatment naturally arising out of such a violent break in a bone.

### Mistaken First Aid

An incident may be noted here concerning a Japanese miner in one of the large Western mines who had his arm broken. His fellow countrymen immediately proceeded to load him up with two quarts of whisky, and on the mine-surgeon's arrival he was greeted by a most hilarious patient, proudly waving a bloody and dangling stump, and surrounded by an admiring throng of countrymen. It is needless to say the arm was lost and nearly the life as well.



# COAL and COKE NEWS

*Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry*

## Washington, D. C.

Taylor Vincent, of West Virginia, representing the United States Coal and Oil Company, of that State, as well as a considerable number of small coal producers, appeared, on Nov. 16, before the Senate Committee on Interstate Commerce, which is holding hearings with reference to anti-trust legislation, and on behalf of his clients recommended to the committee that it report a bill for the establishment of a body to be known as the United States Mining Commission. Mr. Vincent affirmed that the plan was approved by the industry as a whole.

This commission would be composed of five men skilled in the business of mining and selling coal, to be appointed by the President of the United States, with the advice and consent of the Senate. The powers which Mr. Vincent desires to have conferred upon the commission are set forth in a bill which he submitted. This provides in substance (Section 6) that the commission be authorized to sanction trade agreements between competitors engaged in interstate commerce, providing for a joint selling or purchasing agency, whenever, in the judgment of the commission, such trade agreements will not unreasonably restrict competition nor raise prices beyond a point justified by the supply and demand. The bill also provides (Section 7) that the commission be authorized to enforce regulations to secure the safety and health of the employees engaged in and about coal mines, and enforce regulations to prevent waste and conserve the unmined coal.

### THE ARGUMENTS ADVANCED

Mr. Vincent's argument for his proposition is that the existing state of affairs in the bituminous coal-mining industry is so unsatisfactory that some immediate remedy must be had. The remedy desired is the power to make agreements for the fixing of prices, subject to the general control of the Government. In describing the present condition of the industry he made the following statement: "The average sale price through the whole country for 1910 was \$1.11 per ton. The actual cost of producing this coal was \$1.07 per ton, excluding interest and depreciation for the coal mined and exhausted. The item of depreciation will amount to 4c. per ton, while the interest on the investment of \$585,000,000 is \$35,100,000, at 6 per cent. The selling price of coal has remained stationary for the last six years, being \$1.10 in 1904

and \$1.11 in 1910, with an extreme fluctuation of only 8c., while the cost of producing the coal has increased 9c. a ton during that period.

"The consumers of bituminous coal in the United States pay less for their fuel than in any other country in the world. The other branches of industry in this country have been profiting at the expense of the bituminous-coal business, and the only possible way that this industry can protect itself from ruin is by combination, and they dare not combine as long as the anti-trust law hangs over them with its threats to prosecute criminally and dissolve their organization if they do combine."

The Senate committee showed comparatively little sympathy. Some members objected to the substitution of an administrative commission for the courts, while others felt that the granting of permission to make trade agreements was not paralleled by sufficient power to prevent the pushing of the agreements to a point where they would be dangerous or disadvantageous to the community. There was also considerable criticism of the proposal to establish a system of compensation for mine accidents, inasmuch as it was felt that this matter was already under the jurisdiction of the employer's liability commission, acting jointly for the House and Senate.

### THE PITTSBURGH-LAKE COAL RATE

During the past week, the Interstate Commerce Commission has been engaged in hearing argument in the so called Pittsburg coal-district case: "John W. Boileau in his own behalf and in behalf of shippers of Lake coal from the Pittsburg district against the Pittsburg and Lake Erie Railway Company and others."

Oral testimony was presented by Vice-president James E. Walsh, of the Pittsburg Coal Company and others. Mr. Walsh declares that the present 88c. per ton rate on coal is excessive and that the company makes no profit on coal mined for the Lake traffic. He said that his company was doing business at a loss and was holding on in the hope of relief in the future. His company, according to Mr. Walsh, has been crowded out of the markets by West Virginia coal, as to which, he alleged, there was discrimination in rates.

The other coal witnesses worked along much the same lines and presented more or less familiar facts. Probably the most significant development of the week has

been the filing of elaborate exhibits in behalf of the Pittsburg Coal Company, wherein various methods of computing freight rates are set forth in detail and on the strength of the results a reduction from the existing rate is demanded.

## Alabama

**Birmingham**—The Sloss-Sheffield Steel and Iron Company, and the Alabama Consolidated Coal and Iron Company, have withdrawn from the Alabama Coal Operators' Association. It is understood that these companies are dissatisfied with the action of the Tennessee Coal, Iron and Railroad Company and other members of the association in adopting semi-monthly in place of monthly pay-days at their coal and ore mines.

The plan for the merger of the Alabama Consolidated Coal Company and the Southern Iron and Steel Company, it has been stated, will be altered to include the offer made recently by President Hoadley, of the Alabama company, to the dissatisfied preferred stockholders of the Alabama Consolidated Coal and Iron Company, namely: 30 per cent on common stock, in addition to the 150 per cent. of preferred, which they were to receive under the merger plan as originally prepared by the committee.

## California

**San José**—Suit was recently brought against the Monterey Coal Company by A. B. Campbell, who, as assignee of Campbell, Foster & Co., demands over \$331,000, as commissions on sale of the coal company's stock.

**San Francisco**—The Canadian Collieries Company, a British concern of great size, has announced the establishment in this city about Dec. 1 of sales offices and headquarters.

## Colorado

**Coalmont**—A shaft has been sunk here 135 ft. by the Northern Colorado Coal Company and rooms are being turned off in the workings. The track of the Larame, Hahn's Peak & Pacific railroad is within less than three miles of here; and it is expected that the mine will be ready to ship coal by the time the railroad is completed.

**Denver**—Labor troubles in the coal camps of northern Colorado, where a strike has been in progress for some time, have reached a stage where the advisability of calling for troops is being considered.

At Louisville the situation is regarded as particularly critical. The mines there are owned by a Wyoming corporation. President Brown, of the company, on Nov. 28 said unless conditions improved within the next two days he would ask Governor Shafroth for the protection of Federal troops, to which, he says, the company, as a nonresident property holder, is entitled.

Since Saturday, Nov. 25, it is reported, the union and nonunion miners have been in practically open warfare. Strikers and women sympathizers paraded the streets, flourishing revolvers and other weapons and making threats to strike breakers entering the camp.

### Illinois

**Marion**—The closing of the lease of the Saline Valley Railway Company by the Big Four, gives the New York Central an entrance into the coal section west of Marion. The Saline Valley line is unbuilt as yet, but bonds to the amount of \$3,000,000 have been issued. The line will be short, only 22 miles, but will open up valuable coal territory.

**Centralia**—Fire broke out in the Junction City mine, Nov. 18, imperiling the lives of many miners. The blaze was started while a shot was being fired, and gained strong headway. Several narrow escapes of miners were reported.

**Springfield**—The property of the Spaulding Coal Mining Company, at Spaulding, will be sold in the near future to satisfy a claim of \$40,000, held by the Illinois National bank of this city. The Spaulding company is in the hands of a receiver.

Railroads in this district report a larger traffic than usual for this time of year. Mines throughout the region are working five days a week and a shortage of empty cars is felt at some points.

It is understood that an effort is being made by St. Louis operating companies with mines in Illinois to get some action by the Illinois operators on a proposition to ask the Senate Committee on Interstate Commerce to authorize trade agreements in the coal industry under the supervision of a national commission.

**Du Quoin**—With the idea of familiarizing miners with the latest methods and devices for fighting mine fires, J. C. Duncan, superintendent of the Illinois mine-rescue station at Benton, has arranged for a school of instruction in Du Quoin from Dec. 2 to 16.

**Peoria**—Miners at the Champion shaft east of town quit work recently, after a disagreement with the management over the shot-firing question. The men have been firing their own charges, but have insisted that shotfirers be employed by the mine operator, and after a conference decided to walk out. The management, it is understood, has decided to confer with other operators before coming to a conclusion.

### Indiana

**Indianapolis**—The Equitable Mining Company, capitalized at \$80,000, has filed articles of incorporation. The object of the new corporation is the mining of coal, lead, zinc, etc. The principal offices will be in Indianapolis.

**Booneville**—A sympathetic strike involving several hundred men is on at the Kapp's mine, west of here, in the Warwick County field. The reason advanced for the strike by the miners is that some of the men were laid off by the mine management in order, as they claimed, to make some repairs to the mining machinery. The work of making the repairs not going forward, the balance of the men were ordered to strike out of sympathy with the men laid off.

### Kentucky

**Louisville**—The Pond Creek Coal Company has been organized by Hayden, Stone & Co., of Boston, Mass., with a capital stock of \$2,000,000, to develop 30,000 acres of coal lands recently purchased in Pike county. The management of the new company will be identical with that of the Island Creek Coal Company. The property will require but little railroad building to give it excellent transportation facilities and immediate development is contemplated.

**Henderson**—The property of the Southern Coal and Transportation Company, at Robards, Ky., valued at about \$200,000, is to be sold to satisfy creditors.

**Pineville**—Thos. Cairns, of Bell county, has purchased from the Louisville Property Company, which is allied with the Louisville & Nashville Railroad Company, its holdings in Bell and Whitley counties for a consideration of \$1,800,000. The lands conveyed embrace a considerable portion of the Chenoa mining district. There are fourteen going coal mines on the Bell and Whitley county land. In addition there are also thousands of acres of timber lands. Mr. Cairns announces his intention to dispose of the property acquired, either by leasing or selling. He has been identified with the Louisville Property Company since 1886.

**Barbourville**—Work has been started on the extension of the Louisville & Nashville railroad's Wasioto and Black mountain line up Meador creek from Harlan to Agres creek, a distance of five miles.

This extension will pass through the boundary of 10,000 acres of coal land recently leased by Sneed, McGuire & Farmer. These lessees will sublease seven parcels of this boundary of coal and will operate one tract of 2500 acres themselves.

**Morganfield**—The Bell-Union Coal and Coke Company, at Curlew, Union county,

has replaced the tippie recently destroyed by fire and is about to resume operations.

### Minnesota

**Duluth**—Work will be commenced within a few days upon the building of a coal dock involving a capital expenditure of over \$1,000,000. After negotiations extending over several months, the Island Creek Coal Company, the principal in the enterprise, has purchased a waterfront site containing about 30 acres. The price paid for this was in the neighborhood of \$100,000.

The dock to be built will cover the entire property, and will have a storage capacity of 750,000 tons, or a coal handling capacity during the season of 1,500,000 tons. It will be equipped with steel bridges and the most modern type of machinery. Outside of the Pittsburgh Coal company's dock No. 7, the new dock will rank as the largest at the head of the lakes.

### Missouri

**St. Louis**—It is reported that the Hawley-Erb syndicate has purchased the Novinger coalfields, Adair county, Mo., and that the proposed extension of the Iowa Central system to St. Louis will be through this district. Heretofore the Novinger fields have been local to the Quincy, Omaha & Kansas City, a Burlington subsidiary.

The Hawley interests have obtained permission from the Iowa Central executive council to issue \$10,000,000 additional securities.

The Kolb Coal Company, of St. Louis, operating mines at Mascoutah, Ill., has placed a contract with the Ottumwa Box Car Loader Company, of Ottumwa, Ia., for a modern steel tippie. The tippie will be of the "A" frame design, and will be complete with self-dumping cages, weigh pan, reciprocating feeder, shaker screens and steel bins for diverting coal to the various cars.

The mine is located within 18 miles of St. Louis, and will, when completed, be one of the most modern operations in Illinois. The plant is expected to be completed and loading coal by Dec. 25.

### Ohio

**Crooksville**—Work will be resumed at the Carding mine after 18 months' idleness. Two hundred and fifty men will be employed by the Elk Fork Coal Company of Wellston, which acquired the mine at receiver's sale. Plans and specifications have been adopted for the rebuilding of the tippie and the installation of up-to-date mining machinery. Work on the improvements will be started immediately and will be completed by April, it is thought.



**Bridgeport**—The Jefferson Coal Company has abandoned its Piney Fork mine where the men have been on strike for two months and will open a mine abandoned years ago. Only those men from Piney Fork who were not implicated in calling the strike will be employed.

**Cleveland**—The Philips Coal and Coke Company, of Cleveland, has changed its name to the Equitable Coal and Coke Company.

**Columbus**—Plans for opening the sealed up portion of the Black Top mine, located near Cambridge, Guernsey county, in which one man lost his life recently and 11 others were overcome by a fire, are being made by the State mine inspector. Samples of gas have been collected from the portions of the mine which are sealed up and if the analysis proves satisfactory the mine will be reopened.

## Oregon

**Marshfield**—The Millicoma mine on the east shore of Coos bay, which for the past two years has been developed by J. A. Ward, has been sold to the Millicoma Development Company, a new corporation. The development is practically completed and the new company will put the coal on the market. The company has 430 acres of land, under which it is claimed there are 10,000,000 tons of coal of high grade. The shaft has been sunk 275 ft. and it is possible to load the coal from bunkers directly onto vessels.

## Pennsylvania

### BITUMINOUS

**Connellsville**—Idle since April 1, last, fires have been lighted at the Garwood plant of the Dunlap-Connellsville Coke Company, near Brownsville; the activity will continue at least until Feb. 1, and the management believes longer. Fifty-seven of the 119 ovens are in operation and the others are being put in use as rapidly as possible.

The Republic Iron and Steel Company is reported to be firing the 138 ovens at its Atchison plant near Cheat Haven.

**Uniontown**—It is understood that 80 additional ovens at the Connellsville Consolidated Coal and Coke Company's plant at Mt. Sterling will be fired as rapidly as the necessary mine labor can be secured.

**Johnstown**—The Smokeless Coal Company is opening a new mine near its present operation at Ferndale. This will probably double the present output from the local plant.

Strikes are in progress at the Amsbry mine of the Pennsylvania Coal and Coke Company and at the Nant-y-Glo Coal Company's mine. The grievance in the first case is reported to have arisen over the discharge of several motormen and

in the second case because of an occasional lapse of three weeks between pay days.

**Butler**—The strike at the Sherwin coal mines at Karns City has been called off after six weeks' duration.

It is understood that construction of the Shawmut railroad will be resumed and that the line will be extended along the west bank of the Allegheny as far as Limestone Run near Kittanning. Work on the section of the road which runs down the Mahoning creek is progressing.

### ANTHRACITE

**Scranton**—The Delaware & Hudson Coal Company are dumping rock and slate on the hollow ground above the Delaware Breaker in preparation for laying additional tracks which will be used for empty cars. It is said a new breaker will be erected in the early spring.

The People's Coal Company recently acquired the rights and leases for 18 tracts of land in West Scranton from Mrs. H. A. Crawford.

**Wilkes-Barre**—The Exeter Machine Company in West Pittston is said to be going into the coal business on a small scale by erecting a washery near the old Exeter shaft. The company purposes using up the culm bank there for fuel at its plant.

**Pottsville**—Suit to recover \$191,213 in royalties on coal mined has been brought against the Philadelphia and Reading Coal and Iron Company by administrators of the estate of Hugh Bellas.

The Philadelphia syndicate which has taken over the abandoned Lawrence, Bear Ridge and Stanton collieries near Girardville proposes to pump out the old workings and work the deep-lying veins which have never been mined. Pumping operations have been started but since it is estimated that more than two billion gallons of water will have to be removed, the work will probably take some months. It is said three slopes will be put down and modern breakers erected.

## Washington

**Spokane**—Settlement of the coal miners' strike in the provinces of British Columbia and Alberta has greatly brightened the outlook for the mining industry in the Spokane country. By the agreement for a period of three and a half years from date the smelter and mine operators are given assurance of an ample fuel supply for that time.

One of the earliest results of the settlement will be the resumption of operations by the Granby company's mines and smelter. Six hundred men went to work on the properties in the Boundary district on Nov. 21 and 350 others will be employed as soon as coke is received from the Crow's Nest district. The com-

pany is finishing the No. 3 outlet to the Phoenix properties and is getting the bins and crusher in shape to handle a large tonnage, a number of men being put to work during the week to hurry the completion of the work.

Andrew Laidlaw, of Spokane, recently bought the license rights to 12 coal claims, each of 840 acres, on the Flathead river, in East Kootenai, 12 miles south of the Corbin Coal Company's property. These claims extend eight miles north and south along the course of the river, and are said to contain the same series of coal seams found to the north and immediately adjoining on the south. They also are reported to be heavily timbered.

## West Virginia

**Charleston**—Among the new coal companies chartered here recently was the New River & Ohio Coal Company, of this city, to develop coal, iron and other mineral lands. The authorized capital is \$100,000.

The American Coal Company of Pittsburgh was recently granted a charter from this State. The concern is capitalized at \$200,000.

The Horgart Coal and Coke Company, owning 2200 acres in Barbour county, has voted to develop the property.

## Wyoming

**Kemmerer**—The Lincoln Coal Company has leased the properties of the Elk Coal Company and these are now being actively operated.

## Canada

**British Columbia**—Coal from the mines at Lethbridge, Alberta, was placed on the market, Nov. 22, two days after the striking miners returned to work in this district. The agreement between miners and operators was signed at Hosmer, Nov. 17.

Coal mines at Fernie and Coal Creek, shut down since last April, resumed operations on Nov. 20. Mine and railway cars have been rushed in so there will be no delay in bringing out the coal. The miners apparently are well pleased to have their struggle over and be at work once more. Five hundred men are employed on two shifts, and these will be increased as rapidly as conditions permit.

The Columbia Coal and Coke Company is busily engaged in building two long railroad sidings on its property, at Coalmont. These will be ready to connect with the Great Northern by the time that company has its tracks laid into Coalmont.

**Toronto**—The British Columbia coal strike having been settled and work at the mines resumed, the Canadian government has reimposed the duty on coal imports into western Canada, which was temporarily remitted on July 31. The duty will be restored on Dec. 6.

## PERSONALS

James Richards, of La Salle, Ill., is appointed superintendent of the Spring Valley mine, at Dalzell.

J. R. Sharpe has resigned the position of resident superintendent of the Springhill Collieries, and has returned to his home in West Virginia.

Charles B. Spencer has been made general manager of the Pittsburg and Midway Coal Company, of Pittsburg, Ill., vice John N. Hodges, who has retired.

Richard Kirby, who has for the past three years been the mining engineer of the Dominion Coal Company, has resigned his position and returned to his home in Scotland.

C. A. Winehart, of Menominee, Mich., has been appointed northwestern manager of the Hutchinson Coal Company, Fairmont, W. Va., with headquarters at Green Bay, Wisconsin.

M. J. Caples has been appointed vice-president in charge of transportation on the Chesapeake & Ohio railway. Mr. Caples has a thorough knowledge of both the mining and transportation of coal.

George D. Evans, for the past six years engaged in the development of properties in West Virginia for the E. E. White Coal Company, has opened a general civil- and mining-engineering office in Pottsville, Penn.

Percy E. Wright, for the past ten years a sales engineer in connection with the home office of the Jeffrey Manufacturing Company, has been made manager of its newly established branch office in Seattle, Wash.

W. W. Taylor, for several years general superintendent of the St. Paul Coal Company, has been elected president of the company, with offices at Ottawa, Illinois. F. E. Fernekorn, former chief clerk, has been elected secretary.

E. B. Francis, who has been connected with coal and iron companies for a number of years, has been made treasurer of the Hocking Valley Products Company, which is a reorganization of the Hocking Coal and Iron Company.

Dr. J. A. Holmes, director of the U. S. Bureau of Mines, spent Nov. 18 in Birmingham, Alabama, inspecting the recently completed mine-rescue station. He was accompanied to Birmingham by Dr. Eugene A. Smith, State geologist of Alabama.

Señor Abraham Ferriz, the Mexican government engineer, accompanied by a party from the U. S. Bureau of Mines made an examination, Nov. 15, of the mine fire at the Pittsburg & Eastern Company's No. 2 mine at Cherry Valley. The party was in charge of O. H. Reinhold.

## Societies and Technical Schools

The winter meeting of the West Virginia Coal Mining Institute will be held at the Masonic Temple, Fairmont, W. Va., Dec. 4, 5 and 6.

The Coal Mining Institute of America will hold a joint meeting with the Engineers' Society of Western Pennsylvania, at the headquarters of the latter in Pittsburg, Dec. 19 and 20. This is the regular winter meeting of the institute.

## Coal and Coke Patents

### UNITED STATES

Coke-oven door; Louis Wilputte, Joliet, Ill., No. 1,006,036. This coke-oven closure comprises, briefly, an inner plug door having a firebrick insulation and an outer door furnished with means for sealing it against the jambs. Both doors are entirely detachable and may be removed bodily from the oven by means of lifting hooks.

Car for quenching coke; Hans Ries, Munich, Germany. No. 1,006,281.

### GREAT BRITAIN

Improvements in apparatus for the observation of gas caps and testing miners' safety lamps; O. Oldham, Denton, Manchester. No. 26,534 of 1910.

Coal cutters; W. L. Spence, Glasgow. No. 27,517 of 1910.

Improvements in magnetically locked miners' safety lamps; R. Cremer, Leeds. No. 1665 of 1911.

Improvements in relighting devices for miners' safety lamps; E. A. Hailwood, Morley, Yorks. No. 17,089 of 1911.

## Industrial Items

The Vinton Colliery Company has established the headquarters of its management and sales at No. 1 Broadway, New York. The office formerly located in Philadelphia has been given up, but the company has salesmen calling on the trade in that vicinity. It finds that it is in a better position than ever to handle business in the Philadelphia territory.

The Jeffrey Manufacturing Company, of Columbus, Ohio, manufacturer of mining, elevating, conveying and power-transmission machinery and coal-mine equipment, has recently opened another branch office at 1201 American Bank building, Seattle, Wash., from which it will handle its business in the Northwest. This company is maintaining 13 branch offices in the United States, as well as nearly 100 agencies in the leading commercial centers all over the world.

The Wellman-Seaver-Morgan Company, Cleveland, O., has received an

order from the Canadian Pacific Railroad for a \$500,000 coal-handling plant to be erected at Fort William, Ont. The plant will include a bridge, two Hulett unloaders, coal conveyer cars and a trestle. Considerable electrical power equipment will also be required. An interesting fact in connection with this contract is that it is the first order that has been taken for Hulett unloaders for handling coal, as hitherto they have been used exclusively for handling ore.

The American Blower Company, of Detroit, Mich., with a factory also at Troy, N. Y., and numerous branch offices, has come to realize the importance of the Dominion of Canada, as evidenced by the application just filed for a charter for a company to be known as the Canadian Sirocco Company, Ltd., of Windsor, Ont. The Canadian Sirocco Company will hold exclusive patent rights for the manufacture in Canada of Sirocco fans and blowers and will also manufacture the full line of American Blower Company products, consisting of fans, blowers, heating, ventilating, drying apparatus, steam engines, steam traps, etc.

## Trade Publications

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.; Bulletin No. 1002 second edition, 7¼x10 in. 38 pp. descriptive of local battery telephones.

General Electric Company, Schenectady, N. Y.; Bulletin No. 4886, 8x10½ in. 59 pp. "Electricity in Coal Mines." A number of interesting installations are described and illustrated.

Roberts & Schaefer Company, Chicago, Ill., Bulletin No. 23, 6x9 in., 32 pp., descriptive of Holmen Locomotive Coaling Stations. Twenty-five plants are attractively pictured and described.

The Jeffrey Manufacturing Company, Columbus, Ohio, bulletin No. 18-B, 8x10 in., 8 pp., descriptive of the Jeffrey-O'Toole coal cutter, a machine built to cut a kerf at various heights, depending upon the thickness of the coal seam.

Jeffrey Manufacturing Company, Columbus, Ohio, Catalog No. 50, 6x9 in., 142 pp., "Power-Transmission Machinery," giving complete lists of Jeffrey products in this line, including shafting, sheaves, pulleys, gears, etc. Sizes, dimensions and prices are given, also convenient engineering formulas.

Link-Belt Company, Philadelphia and Chicago, book No. 111, 6x10 in., 88 pp. "The Handling and Preparation of Coal at the Mine." This pamphlet illustrates and describes installations of tipples, washeries and conveying machinery for coal mines; also the detailed equipment for such installations as furnished by the Link-Belt Company.



# COAL TRADE REVIEWS

*Current Prices of Coal and Coke and Market Conditions in the Important Centers*

## General Review

The predominating feature in the coal market during the past week has been the car supply; this is reported, almost without exception, as inadequate, and in some instances acutely so. Unusual strength has developed in steam-coal prices, which is credited to the heavy buying, incident to a general improvement in business conditions.

In the extreme East tonnage reports are higher than for the same period last year, despite which stocks are being seriously depleted and new arrivals are slow. Pittsburg reports bituminous as steady and improving, with some activity in coke resulting in the letting of several important contracts.

Lake shipments from all Eastern ports have been unusually heavy this season. This is believed to be due to meager supplies in the Canadian Northwest, because of the labor troubles in the Crow's Nest during the summer. There is no improvement in the car situation in Ohio, while in some districts to the south conditions are such that the railroads are absorbing entire outputs for their own use.

Lack of motive power and proper equipment has resulted in a slow movement in the Middle West. This, together with the heavy snows and lower temperatures, has tended to deplete supplies and increase consumption, with a consequent improvement in the market.

Mines in the Rocky Mountain States are hopelessly behind orders, and in many instances working half capacity because of poor car service. There is a marked increase in the Pacific Coast trade, and both rail and water shipments are slow.

## Boston, Mass.

There is little change, except in some quarters the situation grows more acute. Marine freights are now strong at \$1.10, Hampton Roads to Boston, on large tonnage, and the same rate has been paid on 2500-ton barges to Providence. The shortage on vessels continues, and more shippers are obliged to go into the market for bottoms to make up for the slow movement of transportation or to replace boats that are lost. On car prices, Mystic Wharf, Boston, and at Providence as well are therefore up to new figures, \$3.90 to \$4 for spot coal, and very little is to be had at that.

On Nov. 27, the Boston retailers advanced their price on soft coal to \$4.50,

net tons. All-rail bituminous is showing improvement. Prices on the Clearfields are from \$1.00 to \$1.15, and extra business is being had nearer tide-water than the summer range on Southern coals would permit.

The anthracite companies are swamped with orders so that the situation on stove and chestnut sizes is rapidly getting serious.

## New York

Considerable improvement has been noted here in the market for soft coal during the past week. There has been a marked increase in the spot demand for high-grade steam coals and some betterment in the demand for inferior grades. Contract movement is quite heavy and at this season of the year the movement of coal from New York is at a high level, owing to the heavy shipments going to shoal-water points, where navigation will soon be closed.

Contract movement is being seriously interfered with by the shortage of boats and slow transportation on the Sound, due to unfavorable weather conditions. These seem to be the worst for a number of years and at some points along the Sound where consumers have not stocked up liberally, shortages are being experienced.

Gas-coal slack has shown a decided improvement the past week. The unexpected early closing of Lake shipments caused a shortage sufficient to advance the price more than 25c. a ton over what slack was freely offered at two weeks ago.

The prices of steam grades in the New York market are considerably firmer, and quotations at which shippers are offering coal show an advance of from 5 to 10c. a ton.

## Buffalo, N. Y.

There are a good many evidences of a livelier condition of the bituminous trade. Dealers complain of slow movement by rail and there are sometimes vexatious blockades at junction and transfer points. Certain railroads are accused of allowing distributing centers to choke up so cars cannot be handled and then reported they had not arrived.

The demand for slack is heavy and as soon as the lake trade is ended, so that the making of three-quarter is down to a winter basis the prospects are for fair price. It does not appear that much surplus slack intended for the lakes will be

left over, though the heavy storm of the middle of November has cut down lake shipments.

There is a slight stiffening of bituminous prices, but figures remain at \$2.50 for Pittsburg three-quarter, \$2.40 for mine-run and \$2 for slack. Allegheny Valley prices are about 25c. lower. Coke is without feature, prices being weak at \$4.25 for Connellsville foundry and \$3.50 for stock coke.

Lake shipments cease for the season this week. The amount loaded here for the past week was 87,000 tons. Shippers are anxious to keep up the movement as long as possible, for the Northwestern demand promises to be very heavy during the winter.

## Pittsburg

**Bituminous**—Manufacturing and domestic demand for coal continues good, taking up a large part of the slack made by the close of the Lake shipping season, and operations are fairly heavy. Prices are about as well maintained as formerly, and we quote as the average market level: Nut, \$1@1.05; mine-run, \$1.05@1.10; ¾-in., \$1.15@1.20; 1¼-in., \$1.25@1.30; slack, 40@50c. per ton at mine, Pittsburg district.

**Connellsville Coke**—Contracting for furnace coke for next year has commenced, four or five contracts having been put through, but buyers and sellers are endeavoring to keep the terms reached secret. It is understood that the Rainey interest has taken the Youngstown Sheet and Tube Company's contract as usual, about 35,000 tons a month being involved, and that the price was a flat one, about \$1.65. This interest is believed to have made at least one other contract, while others have made two or three. A market level has thus been disclosed for next year's furnace coke contracts, which may be quoted at \$1.60@1.65 for the first half and at \$1.65@1.80 for the whole year, the higher prices being for special favorites.

There is no general buying as yet, since the majority of consumers prefer to hold off, while among producers also there is conservatism. The common course among consumers will be to wait until near the close of December, and then contract only for the first six months. Furnaces which buy for the year at this time will do so chiefly because they wish to assure themselves a supply from among a few favorite brands. Of course, a large part of the

merchant business for next year is already covered by term contracts still having one, two or more years to run.

Sales of 3000 to 4000 tons of prompt furnace coke have been made in the past week at the regular price of \$1.50. We quote the market as follows: Prompt furnace, \$1.50@1.55; contracts, first half, \$1.60@1.65; year, \$1.65@1.80; prompt foundry, \$1.80@1.90; contract, \$2@2.25.

The *Courier* reports production in the week ended Nov. 18 at 316,379 tons, a decrease of 7000 tons, and shipments at 3546 cars to Pittsburg, 4960 cars to points West and 906 cars to points East, a total of 9412 cars, which is a decrease of 150.

### Philadelphia, Pa.

There has been no diminution in the retail demand for anthracite coal in this market. The continuance of coal-burning weather is in a measure responsible for this, although there has not been any particularly low temperature as yet, but it has been threatening, and, as a consequence, the dealers are flooded with orders.

In the wholesale market, the verdict is almost unanimous that there has never been such a demand in the early winter season. Stocks of all sizes are being depleted, and the individual operators have no difficulty in disposing of all of their product, whether good, bad or indifferent. It is reported that some of the individual concerns are asking and receiving 10 to 15c. premium for their output of certain sizes, and there is some talk of the large companies advancing the prices. Apparently there is no disposition as yet for even a lull in the demand.

### Baltimore, Md.

A canvass of many of the large offices of coal men brought to light the fact that there has been no important change in market conditions during the week. Spot business is about the same as the week previous, and the movement under existing contracts continues as usual.

Those who are buying now are getting coal at low figures. During the past few days, the low grades of coal have been quoted at 70c. per ton. In the office of one of the large coal companies it was stated that some coal had been sold as low as 60c. per ton, but not a large quantity could be purchased at such a price. For the better grades, the prices ranged between \$1.30 and \$1.60 per ton. Because of the absence of any undue activity in market conditions, operators say that the present price level will continue in force for some time to come.

### Columbus, Ohio

Improvement has been reported in practically every branch of the coal trade in Ohio during the past week. The colder weather which prevailed over all of the

State had the effect of strengthening the domestic and steam departments.

A car shortage has developed which has the effect of still further stiffening the market. It is the worst on the Toledo & Ohio Central and the Zanesville & Western, while the Hocking Valley is close up to the limit. A feature recently brought out is the practice of the Chesapeake & Ohio in using Hocking Valley cars in West Virginia territory. Shipments are delayed from two days to almost a week.

The production from Ohio fields has been good despite the car shortage which curtailed outputs to a certain extent. In the Hocking Valley the production was about 85 per cent. capacity while in eastern Ohio it was about 80 per cent. In the Pomeroy Bend district the tonnage was large and the same is true of the Jackson and Cambridge fields.

Prices prevailing in Ohio are: Domestic lump in the Hocking valley, \$1.50; domestic lump in Pomeroy Bend, \$1.60@1.75; 3/4-in., \$1.35; nut, \$1.15; mine-run in the Hocking valley, \$1.05@1.15; mine-run in eastern Ohio, 95c.@\$1.05; nut, pea and slack, 40@50c.; coarse slack, 35@45c.; fancy grades of domestic sizes, \$1.75@2.25.

### Cleveland, Ohio

The lake coal trade is in about the same shape as it has been for the past week. There are a large number of cargoes on the market and the tonnage is very scarce. With no boats in sight, the shippers are not bidding, but a few big carriers could be placed for the head of Lake Superior at 80 cents.

PREVAILING PRICES AT CLEVELAND

	Ohio No. 8	Middle District	Pocahontas
Mine-run.....	\$0.95@1.00	\$1.10@1.15	\$1.05@1.15
4-in.....	1.05@1.10	1.25@1.25	1.15@1.20
1 1/2-in.....	1.15@1.25	1.50@1.65	1.25@1.30
Slack.....	0.60@0.70	0.80@0.85	0.60@0.70
Lump.....			2.15@2.30
Youghiogheny nut.....			1.00@1.05

Shipments to retail coal yards and to manufacturing consumers increased slightly this week. Genuine winter weather appeared with a suddenness that has rarely been paralleled, the temperature dropping over 30 deg. in a few hours.

### Cincinnati, Ohio

Local market conditions are much improved over three or even two weeks ago. The principal cause for this has been the weather, although credit is due the steadying influence of tightness in the car situation, particularly on the Chesapeake & Ohio and Norfolk & Western railroads. There has been increasing difficulty in getting a sufficient number and the desired type of cars on most of the roads in this territory for

some time. On at least one road the situation has become acute within the last few days, and it has resulted in serious inconvenience to several of the operations.

This car shortage has resulted in considerable friction in several of the wholesale offices on account of the railroads' inability to furnish the buyer with the equipment ordered. The number of hopper cars, it would seem, has been increased more rapidly than have the facilities of country dealers for unloading that class of equipment.

The steam demand is increased sufficiently to justify the statement that there must be increased industrial activity. The increase is not large, nor is it confined to a limited territory, but is of such a character as to indicate that general business is improved over what it was some weeks ago. Of course it is natural that there should be some steam-coal increase because of the continued cold weather.

### Louisville, Ky.

The local market remains firm, with good supplies and the demand continuing brisk. Prevailing low temperatures are responsible for the latter. Shipments from Pittsburg continue to arrive regularly and the same is true of Kentucky and Tennessee districts. The western Kentucky mines are working more regularly now than during the past month, due to the practical settlement of the Illinois Central strike trouble. One local dealer is advertising extensively a rate of \$3.50 a ton, cash, for Pittsburg lump, on a 2000 lb. to the ton basis. The prevail-

ing retail price, however, is \$3.75 a ton for Pittsburg. Straight Creek is retailing at \$4; Jellico coal, of the best grade, is bringing the same, and Wilton, \$3.60.

### Charleston, W. Va.

The closing of lake shipments has made a change in conditions in the Kanawha and New River districts, in that there has been a decrease in shipments. There has been a fairly good increase in domestic movement both east and west, but this has by no means made up for the loss caused by the discontinuance of the coal heretofore going to the lakes. This condition was predicted in these despatches and was not unexpected by the coal operators.

Reports from the Norfolk & Western territory state that conditions are good,



which is usual for that district. The increase there has been greater than in any other section of the State. The only temporary setback suffered in the Norfolk & Western territory was during a let-up at the United States Steel operations at Gary.

### Memphis, Tenn.

The operators in western Kentucky have had several meetings, resulting in a decision to advance prices on domestic coal, beginning Dec. 1. These prices will be \$1.50 for screened lump, \$1.25 for nut, \$1 for mine-run.

The mines located on the Illinois Central railroad are still in a bad way for equipment. They get few cars for loading, and occasionally the railroad takes the entire output of a day's run for its own use.

The retail prices for Memphis are: \$4 for Kentucky lump coal, \$4.25 for Alabama, \$4.75 for Jellico, \$5 for Piper or Cahaba, \$3.50 for Kentucky nut and \$4 for Illinois washed coal.

These are the highest prices Memphis has had during any portion of the winter.

### Nashville, Tenn.

There has been little change in the coal situation in the West Kentucky fields, and the demand for domestic coal may be considered good, although it is a weather-market proposition entirely in this field.

On Dec. 1, the price of domestic lump coal will be raised by the operators to \$1.50 per ton, which is a 25c. per ton advance over the prevailing price. A small increase will be asked also for the finer grades of coal.

Dealers in this section are still carrying a small stock and a bad spell of weather will find the majority of them with practically no coal in their yards.

There is a good deal of talk in this district relative to a strike on April 1, 1912, and the operators seem to think that this is inevitable.

### Indianapolis

The coal market has shown some improvement but is not yet entirely satisfactory to the mine operators. The market has been stimulated by cold weather, but the movement of coal from the mines has been greatly delayed because of slow transportation.

Both operators and miners in the block-coal fields of Clay and Vigo counties are bitter in condemning the policy of the railroads, because of their inability to properly handle the coal. A revival in business has been experienced by the coal companies within the last last month, but owing to the scarcity of cars they have been able to fill only a comparatively small number of their orders.

### Chicago

The general tone of the coal market is far better than it has been for several months. The demoralization which has affected smokeless mine-run coal for the past six months is past, and there has been a boost in price from \$1 to \$1.10 at the mines. This price is quoted everywhere.

Leading shippers are practically out of

coal for domestic use this season, and as a result a number of the docks are already running short on smokeless lump and egg. The Splint coals are also becoming popular, as well as those from the Kentucky-Tennessee fields.

### St. Louis, Mo.

There is practically no change in the local market, with the exception that the smaller sizes in raw and washed coals

PREVAILING PRICES AT CHICAGO

	Pocahontas and New River	Sullivan County	Springfield	Clinton County
Screen lump.....		\$2.10		
Steam lump.....			\$1.97@2.07	\$2.00@2.20
Domestic lump.....		\$2.50@2.60	2.27@2.47	2.17@2.37
Mine-run.....	\$3.15		1.82@1.87	1.82@2.02
Egg.....		2.30@2.40		
Lump and egg.....	\$4.15@4.30			
Screenings.....		1.47@1.52	1.42@1.52	1.42@1.52

the market, so far as Southern Illinois and Hocking Valley coals are concerned. The demand for these grades has led to an overflow upon some of the cheaper classes of coal. The demand for anthracite is strong and Western and Eastern buyers are engaged in a vigorous contest to obtain what they can of this class of fuel. A marked improvement has been noted in the furnace- and foundry-coke market.

**Coke**—Prices asked for coke are: Connelville, \$4.50@4.65; Wise county, \$4.50@4.65; byproduct egg and stove, \$4.95; byproduct nut, \$4.55@4.65; gas house, \$4.85.

have gone up from 10c. on raw screenings to 25c. a ton on washed No. 1. The car shortage has practically brought about this condition in the high-grade market, and, again, there is an extraordinary demand for screenings and steam sizes from the Northwest.

Lack of motive power on the Frisco has retarded shipments somewhat during the past week, and the Iron Mountain and Illinois Central are working their mines about two days a week. It is likely that prices of all high-grade coals will advance to something like \$2 in the next 10 or 15 days; especially will this be so on Franklin county lump and egg.

PREVAILING PRICES AT ST. LOUIS

	Franklin County <sup>1</sup>	Williamson County <sup>1</sup>	Standard
6-in. lump.....	\$1.75@1.85	\$1.50@1.65	\$1.10@1.20
2-in. lump.....			1.00@1.05
3x6-in. egg.....	1.75@1.85	1.40@1.55	0.90@0.95
No. 1 nut.....	1.75	1.20@1.35	0.75@0.85
No. 2 nut.....	1.40@1.50	1.10@1.20	0.65@0.70
No. 3 nut.....	1.25		
2-in. screenings.....		0.55@0.65	0.30@0.35
Mine-run.....		1.00@1.10	

<sup>1</sup> Freight to St. Louis, 67c.

### Minneapolis—St. Paul

The situation in the trade is unchanged, everybody enjoying a steady business. There has been fair sleighing for a week which has facilitated hauling and dealers have been able to keep up with orders.

The dock people have been more than busy filling orders, but have been able to meet the demands well. Stocks on the docks are heavy now at the close of navigation. Insurance expires Nov. 25, and the shipments of coal expected up after that date are only scattering cargoes.

The wholesale companies in the Twin Cities, handling all rail will show a fine month's business during November. Their mines are running every day and behind on orders. Some are much hampered by lack of cars at their mines.

For some reason or other, there seems to be an increased tonnage of smokeless

Anthracite is quoted at: chestnut, \$7.20; egg and stove, \$6.95; grate, \$6.70. Gas-house coke is moving slowly at \$4.65, St. Louis, and byproduct at \$5.

### Salt Lake City, Utah

There are just about ten orders on file for each car of coal mined by the Utah mines, and as the coal season does not really start until Dec. 1, the indications are that this proportion is liable to increase rather than diminish.

The coldest November weather in many years brought a demand from the outside towns which could not be denied if it were possible to supply it; but as the mines were already operating to their fullest extent with the limited car supply, the dealers received little satisfaction.

No more cars are in prospect and as operating is becoming more difficult as

the cold weather advances, the movements of those in service on the coal roads will become slower. Mines are still working about half time.

There has been no change in price, neither wholesale nor retail, on Utah coal.

### Spokane, Wash.

There is no change in local prices, though the market is fairly active. The resumption of operations in the Crow's Nest mines means there will be sufficient supplies for all demands throughout the year, also that the smelting plants soon again will be running full blast.

Jay P. Graves, of Spokane, vice-president and general manager of the Granby Consolidated Mining, Smelting and Power Company, said that the furnaces at Grand Forks, B. C., will be blown in within three weeks, adding:

"It will take some time to get going again at full capacity; besides requiring an ample supply of fuel on hand, there will be difficulty in building up an adequate working force at the mines after such a long shutdown."

### San Francisco

We have to record quite an increase in the sale of coal during the past week. Lower temperature has stimulated the retail trade. Domestic consumers are getting a foretaste of winter weather and are accordingly providing against the rainy days we are justified in expecting during the next four months.

There is a marked improvement in country business, as the effects of winter are felt sooner there. There is a brisk demand for carloads to the interior; such orders are not being filled with customary despatch, owing to the car shortage which still continues.

Shippers from Utah mines are particularly handicapped because of a lack of motive power by the railroads. As a consequence we are advised of an increase in price of 25c. and 50c. per ton, f.o.b. the mines at these points.

Altogether the situation looks good and is viewed by all parties to the trade as quite satisfactory. The wholesale prices, ex-bunker or at ship's side, are as follows, per short ton:

Wellington, clean	\$8.00
Wellington, average	7.50
Australian, clean	8.00
Australian, average	7.50
Puget Sound, clean	6.50
Puget Sound, steam	\$5.00 and 5.50
Pennsylvania anthracite	15.00
Colorado anthracite	12.50
New Mexico anthracite	13.50
Anthracite briquets	10.00
Cumberland, smithing	12.50
Utah, Wyoming and New Mexico, clean (for domestic use only)	\$9.00 and 8.00

### Production and Transportation Statistics

#### THE VIRGINIAN RAILWAY COMPANY

Shipments over the Virginian Railway for the month of October amounted to 293,971 short tons.

#### CHESAPEAKE & OHIO RAILWAY

The following is a comparative statement of the coal and coke traffic over the Chesapeake & Ohio lines for the three months ending Sept. 30, 1911:

COAL				
To	1911	Per Cent.	1910	Per Cent.
Tidewater	982,627	22	1,110,098	26
East	483,866	11	396,548	9
West	2,947,198	65	2,616,225	63
Total	4,413,691		4,122,871	
Bituminous from connections	56,581	1	19,208	1
Anthracite from connections	9,579	1	3,841	1
Grand total	4,479,851	100	4,145,920	100
COKE				
Tidewater	1,020	2	13,641	14
East	31,684	57	54,530	54
West	16,755	30	24,899	25
Total	49,459		93,070	
From connections	6,060	11	7,624	7
Grand total	55,519	100	100,694	100

#### NORFOLK & WESTERN RAILWAY COMPANY

The following is the statement of coal and coke shipments, in net tons, over this company's lines for October and for the first 10 months of 1910 and 1911:

#### REPORT OF NORFOLK & WESTERN RAILWAY

Shipments	OCTOBER		10 MONTHS ENDING OCTOBER 31	
	1910	1911	1910	1911
Tidewater foreign coal	37,054	68,022	913,665	806,893
Tidewater foreign coke			55,365	61,665
Tidewater coastwise coal	273,624	299,626	2,558,552	2,486,951
Other domestic coal	1,308,581	1,462,687	10,963,159	12,506,216
Other domestic coke	169,723	117,077	2,237,876	1,199,646
Total	1,788,982	1,947,412	16,728,617	17,061,371

#### BALTIMORE & OHIO RAILROAD COMPANY

The coal and coke shipments over the lines of the Baltimore & Ohio Railroad Company for the month of October, 1911, and for the same month of the previous year, were as follows, in short tons:

	1910	1911
Coal	2,722,144	2,801,933
Coke	386,727	338,133
Total	3,108,871	3,140,066

#### LEHIGH & WILKES-BARRE COAL CO.

The following is a comparative statement of shipments by this company for fiscal years ending June 30, 1910 and 1911:

	1910-11	1909-10
From company owned lands <sup>1</sup>	3,042,486	2,885,314
From company owned lands <sup>2</sup>	967,933	962,577
From leased lands <sup>1</sup>	1,104,545	994,789
From leased lands <sup>2</sup>	115,024	140,576
From washeries <sup>1</sup>	137,411	141,668
From washeries <sup>2</sup>	171,943	197,657

Total of all..... 5,539,345 5,322,583  
<sup>1</sup> Coal shipped by company. <sup>2</sup> Coal shipped by tenants.

#### COAL EXPORTS AND IMPORTS FOR 1910

The exports of coal from the United States during 1910, according to the United States Geological Survey, were 13,805,866 long tons, valued at \$41,470,-

792. Of this quantity 3,021,627 long tons, valued at \$14,785,387, was anthracite, and 10,784,239 long tons, valued at \$26,685,405, was bituminous coal.

The imports of anthracite amounted in 1910 to only 8,195 long tons, valued at \$42,244, and those of bituminous coal to 1,497,709 long tons, valued at \$3,975,561.

#### LAKE SHIPMENTS FROM TOLEDO

Shipments for Hocking Valley docks to Nov. 24 of present year amounted to 2,298,065 tons, which is much larger than for the same period last year.

### Foreign Markets

#### GREAT BRITAIN

Tonnage arrivals are more satisfactory, but the market has not been materially affected meantime, and prices still show some irregularity for immediate loading. For backward shipment, however, sellers are holding for firm figures for both large and small. The labor situation is regarded more hopefully in view of the decision of the National Miners' Con-

ference not to force a national strike. At present quotations are as follows:

Best Welsh steam coal	\$4.08
Seconds	3.90
Thirde	3.63
Best dry coals	3.96
Best Monmouthshire	3.66@3.69
Seconds	3.48
Best Cardiff small steam coal	1.92@1.98
Seconds	1.80@1.86

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½ per cent.

#### NOVA SCOTIA

Exports of coal from Nova Scotia for the first 10 months of the present year were 4,436,907 long tons. During the same period last year the exports were 3,998,300 long tons, showing an increase for the present year of 438,607 long tons.

#### RUSSIA

Coal production in the Donetz basin, the most important district in Russia, for seven months, ended July 30 was in metric tons: Anthracite, 1,528,835; bituminous, 9,403,641; total, 10,982,176 tons, an increase of 1,496,194 tons over last year.